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COSTS

SCHOOL YEAR 1915–1916

THE GARY PUBLIC SCHOOLS

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The Gary Schools: A General Account
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THE GARY PUBLIC SCHOOLS

COSTS

SCHOOL YEAR 1915-1916

BY
FRANK P. BACHMAN
AND
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1918

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INTRODUCTION

The Gary Plan

In the last few years both laymen and professional educators have engaged in a lively controversy as to the merits and defects, advantages and disadvantages of what has come to be called the Gary idea or the Gary plan. The rapidly increasing literature bearing on the subject is, however, deficient in details and too often partisan in tone. The present study was undertaken by the General Education Board at the request of the Gary school authorities for the purpose of presenting an accurate and comprehensive account of the Gary schools in their significant aspects.

In the several volumes in which the main features of the Gary schools are separately considered, the reader will observe that, after presenting facts, each of the authors discusses or—in technical phrase—attempts to evaluate the Gary plan from the angle of his particular interest. Facts were gathered in a patient, painstaking, and objective fashion; and those who want facts, and facts only, will, it is believed, find them in the descriptive and statistical portions of the respective studies. But the successive volumes will discuss principles, as well as state facts. That is, the authors will not only describe the Gary schools in the frankest manner, as they found them, but they will also endeavor to interpret them in the light of the large educational movement of which they are part. An educational conception may be sound or unsound; any particular effort to embody an educational conception may be adequate or inadequate, effective or ineffective. The public is interested in knowing whether the Gary schools as now conducted are efficient or inefficient; the public is also interested in knowing whether the plan as such is sound or unsound. The present study tries to do justice to both points.

What is the Gary plan?

Perhaps, in the first instance, the essential features of the Gary plan can be made clear, if, instead of trying to tell what the Gary plan is, we tell what it is not. Except for its recent origin and the unusual situation as respects its foreign population, Gary resembles many other industrial centers that are to be found throughout the country. Now, had Gary provided itself with the type of school commonly found in other small industrial American towns, we should find there half a dozen or more square brick "soap-box" buildings, each accommodating a dozen classes pursuing the usual book studies, a playground, with little or no equipment, perhaps a basement room for manual training, a laboratory, and a cooking room for the girls. Had Gary played safe, this is the sort of school and school equipment that it would now possess. Provided with this conventional school

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system, the town would have led a conventional school life—quiet, unoffending, and negatively happy—doing as many others do, doing it about as well as they do it and satisfied to do just that.

As contrasted with education of this meager type, the Gary plan is distinguished by two features, intimately connected with each other:

First—the enrichment and diversification of the curriculum;

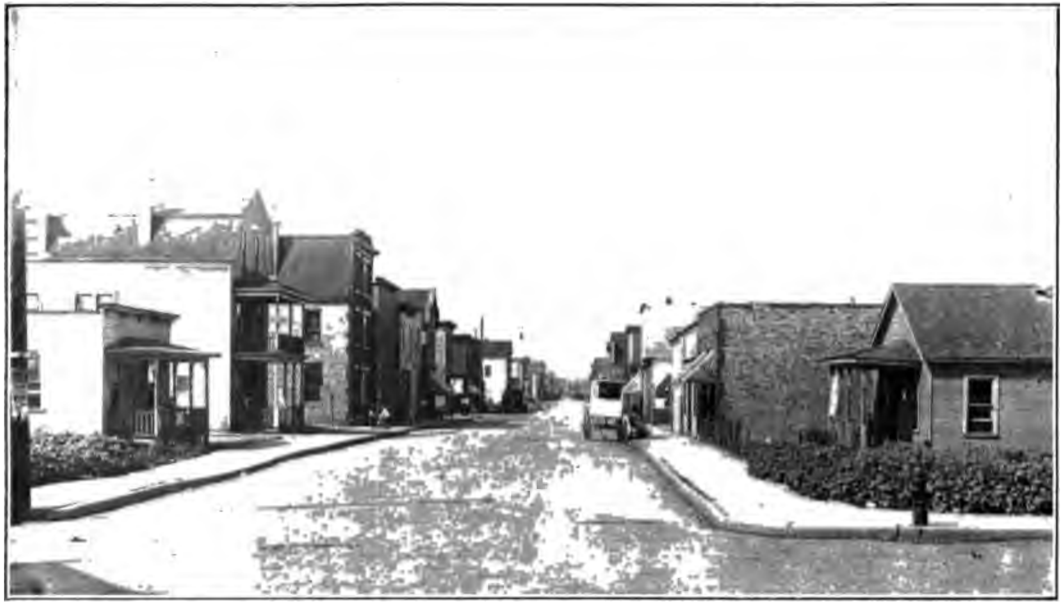
Second—the administrative device that, for want of a better name, will be tentatively termed the duplicate school organization.

These two features must first be considered in general terms, if the reader is to understand the detailed description and discussion.

As to the curriculum and school activities. While the practice of education has in large part continued to follow traditional paths, the progressive literature of the subject has abounded in constructive suggestions of far-reaching practical significance. Social, political, and industrial changes have forced upon the school responsibilities formerly laid upon the home. Once the school had mainly to teach the elements of knowledge; now the school is charged with the physical, mental, and social training of the child. To meet these needs a changed and enriched curriculum, including community activities, facilities for recreation, shop work, and household arts, has been urged on the content side of school work; the transformation of school aims and discipline on the basis of modern psychology, ethics, and social philosophy has been for similar reasons recommended on the side of attitude and method.

These things have been in the air. Every one of them has been tried and is being practised in some form or other, somewhere or other. In probably every large city in the country efforts have been made, especially in the more recent school plants, to develop some of the features above mentioned. There has been a distinct, unmistakable, and general trend toward making the school a place where children "live" as well as "learn." This movement did not originate at Gary; nor is Gary its only evidence. It is none the less true that perhaps nowhere else have the schools so deliberately and explicitly avowed this modern policy. The Gary schools are officially described as "work, study, and play" schools—schools, that is, that try to respond adequately to a many-sided responsibility; how far and with what success, the successive reports of the Gary survey will show.

It must not, however, be supposed that the enriched curriculum was applied in its present form at the outset or that it is equally well developed in all the Gary schools. Far from it. There has been a distinct and uneven process of development at Gary; sometimes, as subsequent chapters will show, such rapid and unstable development that our account may in certain respects be obsolete before it is printed. When the Emerson school was opened in 1909, the equipment in laboratories, shops, and museums, while doubtless superior to what



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was offered by other towns of the Gary type, could have been matched by what was to be found in many of the better favored larger towns and cities at the same period. The gymnasium, for example, was not more than one third its present size; the industrial work was not unprecedented in kind or extent; the boys had woodwork, the girls cooking and sewing. But progress was rapid: painting and printing were added in 1911; the foundry, forge, and machine shop in 1913. The opportunities for girls were enlarged by the addition of the cafeteria in 1913. The auditorium reached its present extended use as recently as the school year 1913–14. The Froebel school, first occupied in the fall of 1912, started with facilities similar to those previously introduced piecemeal into the Emerson.

These facilities, covering in their development a period of years, represent the effort to create an elementary school more nearly adequate to the needs of modern urban life. The curriculum is enriched by various activities in the fields of industry, science, and recreation. Questions as to the efficiency with which these varied activities have been administered will be discussed by the various contributors to the present study. Meanwhile, it is perhaps only fair to point out that the modern movement calls not only for additions to, but eliminations from, the curriculum and for a critical attitude toward the products of classroom teaching. How far, on the academic side, the Gary schools reflect this aspect of the modern movement will also presently appear.

The administrative device—the "duplicate" organization, noted above as the second characteristic feature of the Gary plan—stands on a somewhat different footing, as the following considerations make plain.

Once more, Mr. Wirt was not the inventor of the intensive use of school buildings, though he was among the first—if not the very first—to perceive the purely educational advantage to which the situation could be turned. The rapidity with which American cities have grown has created a difficult problem for school administrators—the problem of providing space and instruction for children who increase in number faster than buildings are constructed. The problem has been handled in various ways. In one place, the regular school day has been shortened and two different sets of children attending at different hours have been taught daily in one building and by one group of teachers. Elsewhere, as in certain high schools, a complete double session has been conducted. The use of one set of schoolrooms for more than one set of children each day did not therefore originate at Gary.

Another point needs to be considered before we discuss the so-called duplicate feature of the Gary plan. In American colleges, subjects have commonly been taught by specialists, not by class teachers. The work is "departmentalized"—to use the technical term. There is a teacher of Latin, a teacher of mathematics, a teacher of physics, who together instruct every class—not a separate teacher of each class in all subjects. Latterly, departmentalization has spread from the college into the high school, until nowadays well organized high schools and the upper grades of elementary schools are quite generally "departmentalized," i.e., organized with special teachers for the several subjects, rather than with one teacher for each grade.

Out of these two elements, Gary has evolved an administrative device, the so-called duplicate school, which, from the standpoint of its present educational significance, does indeed represent a definite innovation.

For the sake of clearness, it will be well to explain the theory of the duplicate school by a simplified imaginary example:

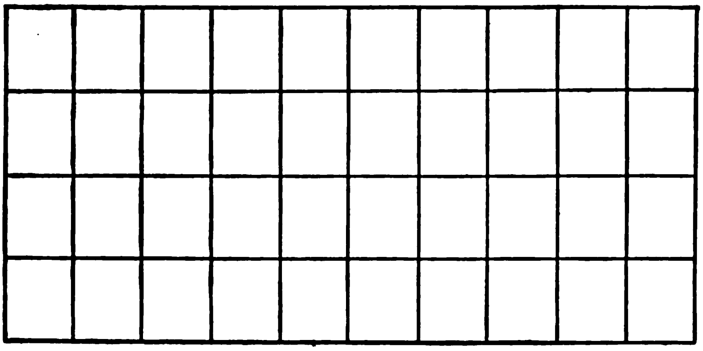
Let us suppose that elementary school facilities have to be provided for, say, 1,600 children. If each class is to contain a maximum of 40 children, a schoolhouse of 40 rooms would formerly have been built, with perhaps a few additional rooms, little used, for special activities; except during the recess (12 to 1:30) each recitation room would be in practically continuous use in the old-line subjects from 9 to 3:30, when school is adjourned till next morning. A school plant of this kind may be represented by Figure I, each square representing a schoolroom.

The "duplicate" school proposes a different solution. Instead of providing 40 classrooms for 40 classes, it requires 20 classrooms, capable of holding 800 children; and further, playgrounds, laboratories, shops, gardens, gymnasium, and auditorium, also capable of holding

800 children. If, now, 800 children use the classrooms while 800 are using the other facilities, morning and afternoon, the entire plant accommodates 1,600 pupils throughout the school day; and the curriculum is greatly enriched, since, without taking away anything from their classroom work, they are getting other branches also. A school thus equipped and organized may be represented by Figure II, in which A represents 20 classes taking care of 40 children each (800 children), and B represents special facilities taking care of 800 children. As A and B are in simultaneous operation, 1,600 children are cared for.

FIGURE I
REPRESENTS OLD-FASHIONED SCHOOLHOUSE

40 rooms for 40 classes, of 40 children each, i. e., facilities for the academic instruction of 1,600 children. A school yard and an extra room or two, little used, for special activities, are also usually found.



This method of visualizing the "duplicate" school serves to correct a common misconception. The plan aims to intensify the use of schoolrooms; yet it would be incorrect to say that 20 classrooms, instead of 40, as under the old plan, accommodate 1,600 children. For while the number of classrooms has been reduced from 40 to 20, special facilities of equal capacity have been added in the form of auditorium, shops, playground, etc. The 20 classrooms apparently saved have been replaced by special facilities of one kind or another. The so-called duplicate organization and the longer school day make it possible to give larger facilities to twice as many children as the classrooms alone would accommodate. The duplicate school, as developed at Gary, is not therefore a device to relieve congestion or to reduce expense, but the natural result of efforts to provide a richer school life for all children.

FIGURE II

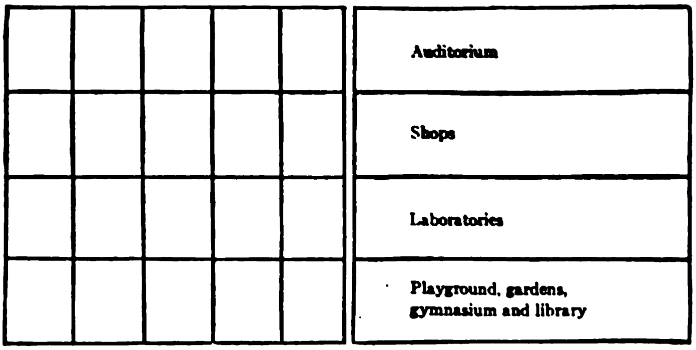
REPRESENTS THE GARY EQUIPMENT

A

20 classrooms for academic instruction of 20 classes of 40 children each (800 children) in the morning hours and an equal number in the afternoon (1,600 in all daily)

B

Special facilities, taking care of 800 children in the morning hours and an equal number in the afternoon hours (1,600 in all daily)



The enriched curriculum and the duplicate organization support each other. The social situation requires a scheme of education fairly adequate to the entire scope of the child's activities and possibilities; this cannot be achieved without a longer school day and a more varied school equipment. The duplicate school endeavors to give the longer day, the richer curriculum, and the more varied activities with the lowest possible investment in, and the most intensive use of, the school plant. The so-called duplicate school is thus a single school with two different types of facilities in more or less constant and simultaneous operation, morning and afternoon.

Such is the Gary plan in conception. What about the execution? Is it realized at Gary? Does it work? What is involved as respects space, investment, etc., when ordinary classrooms are replaced by shops, playgrounds, and laboratories? Can a given equipment in the way of auditorium, shops, etc., handle precisely the same number of children accommodated in the classrooms without doing violence to their educational needs on the one hand, and without waste through temporary disuse of the special facilities, on the other? To what extent has Gary modified or reorganized on modern lines the treatment of the common classroom subjects? How efficient is instruction in the usual academic studies as well as in the newer or so-called modern subjects and activities? Is the plan economical in the sense that equal educational advantages cannot be procured by

Froebel School Building

any other scheme except at greater cost? These and other questions as to the execution of the Gary plan are, as far as data were obtainable, discussed in the separate volumes making up the present survey.

The concrete questions above mentioned do not, however, exhaust the educational values of a given school situation. From every school system there come imponderable products, bad as well as good. Aside from all else, many observers of the Gary schools report one such imponderable in the form of a spiritual something which can hardly be included in a study of administration and eludes the testing of classroom work. These observers have no way of knowing whether Gary school costs are high or low; whether the pupils spell and add as well as children do elsewhere; but, however these things may be, they usually describe the pupils as characterized by self-possession, resourcefulness, and happiness to an unusual degree. While different schools and indeed different parts of the same school vary in this respect, the members of the survey staff agree that, on the whole, there is a basis of fact for these observations. Gary is thus something more than a school organization characterized by the two main features above discussed.

The reason is not far to seek. Innovation is stimulating, just as conformity is deadening. Experiment is in this sense a thing wholesome in itself. Of course it must be held to strict accountability for results; and this study is the work of persons who, convinced of the necessity of educational progress, are at the same time solicitous that the outcome be carefully observed. The fact that customary school procedure does not rest upon a scientific basis, does not willingly submit itself to thorough scrutiny, is no reason for exempting educational innovations from strict accountability. The very reverse is indeed true; for otherwise innovation may imperil or sacrifice essential educational values, without actually knowing whether or not it has achieved definite values of its own. Faith in a new program does not absolve the reformer from a watchful and critical attitude toward results. Moreover, if the innovator formulates his purposes in definite terms and measures his results in the light of his professed aims, the conservative cannot permanently escape the same process. Gary, like all other educational experiments, must be held accountable in this fashion. Subject however to such accountability, the breaking of the conventional school framework, the introduction of new subject matter or equipment, even administrative reorganization, at Gary as elsewhere, tend to favor a fresher, more vigorous interest and spirit. Defects will in the following pages be pointed out in the Gary schools—defects of organization, of administration, of instruction. But there is for the reasons just suggested something in the Gary schools over and above the Gary plan. Problems abound, as in every living and developing situation. But the problems are the problems of life, and, as such, are in the long run perhaps more hopeful than the relatively smooth functioning of a stationary school system. Thus, not-withstanding the defects and shortcomings which this study will candidly point out, the experiment at Gary rightly observed and interpreted is both interesting and stimulating.

COSTS

SCHOOL YEAR 1915–1916

COSTS

I. ACCOUNTING METHODS

THE basic financial record of the Gary schools consists of a single-entry cash book of receipts and disbursements, prescribed by the State Bureau of Public Accounts, and the original documents supporting the several entries.

In recording receipts and expenditures, the cash record makes no fund divisions other than the Common School Tuition Fund, available only for teachers' salaries; Special School Fund, available for any school purposes whatsoever; Bond Principal and Interest Fund, available only to redeem bonds and pay interest thereon; and Loan Funds, the proceeds of bonds.

Distribution of expenditures to show the character of the expense—that is, whether for operation, upkeep, fixed charges, or capital outlay—is made on records supplementary to the cash book, and these are worked out mostly by students, as a laboratory exercise in the commercial department, from invoices, payrolls, requisitions, work orders, and the like.

Finally, the cash record takes cognizance of revenues only when they are received, and of expenditures only when paid, with the result that revenues credited against one school year may belong to the preceding or succeeding year, and an expenditure paid in 1915-1916 may represent an obligation incurred in 1914-1915; thus, to some extent, accounts of different school years overlap.

The methods employed do not adequately meet the requirements of a school system such as that of Gary, organized into day, Saturday, night, summer, and Sunday schools, and conducting numerous instructional and industrial activities. For example, from the records as they stood July 31, 1916, it was impossible to draw either a balance sheet or a specific revenue and expenditure statement for the school year 1915-1916. Furthermore, an examination of the cost reports developed the fact that these are not reports of total direct expenditures, but tabulations of expenses after the direct expenditure has been apportioned among a number of organizations or activities on a theoretical or empirical basis.

Therefore, to determine the expenditures of the schools for the fiscal year August 1, 1915, to July 31, 1916, it was necessary to canvass all expenditures for the period in order to eliminate such items as belonged to other years and to add such invoices and payrolls as remained unpaid at the year's end.

It was also necessary to analyze anew all cost reports. In the course of this analysis, original documents were often encountered which did not contain the required information. Store records were not infrequently lacking. Inventories showing materials on hand at the beginning and end of the year were either not at hand or were inaccurate and incomplete. Expenditures were not carefully divided as between plants, organizations, and services, and often the character of the expenditures was not clearly defined.

The analysis in question required, as the first step, the preparation of an adequate expenditure code. The code prepared takes into consideration:

(1) Divisions by school plants.

(2) Character of expenditure.

(3) Services.

Services were subdivided into

(a) Services relating to administration, the expenditure for which can not advantageously be distributed to any other service division.

(b) Other general services, such as compulsory attendance and medical inspection.

(c) Services relating specifically to property—its acquisition, obligations of ownership, operation, and upkeep.

(d) Services relating specifically to instruction.

The expenses of the Gary schools as compiled on the basis of this code and our analysis of the cost, along with related data, are reported in the appendix in the following tables:

A. Expenditures and Revenues in Summary.

B. Balance Sheet.

C. Operation Statement.

D. Revenue Statement.

E. Fund Statement.

F. Inventory Statement.

G. Bond Statement.

H. Expenditures by Organization in Summary and in Detail.

These tables, it will be noted, are the result of our own work, and are independent of what the Gary authorities may have compiled or published, although it should be stated that in distributing expenditures we did not depart from the bases of distribution employed at Gary.[1]

The present report is confined entirely to the description and discussion of Gary expenditures. Comparison with other cities is not attempted. To have assembled data strictly comparable with Gary would have involved an equally thoroughgoing financial study of other cities. Nevertheless, those wishing to institute comparisons between Gary and any other school system will find the required detail for the Gary schools in the tables of the appendix, and will only need to make a similar cost classification and distribution for the system to be compared.

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[1] For example, the plant operation expense at the Jefferson School is distributed, 72 per cent. to the day school, 10 per cent. to the Saturday school, and 18 per cent. to the night school, and we did not alter these bases of distribution.

II. CURRENT COST OF ENTIRE SYSTEM

PUBLIC school costs embrace capital outlays for grounds, buildings, and permanent equipment, current expenses for operation and upkeep, and fixed charges (that is, interest, pensions, etc.). Undoubtedly, a complete cost[1] report should also include a reasonable charge on capital invested, and an allowance for depreciation, inasmuch as time and use antiquate the best of buildings and equipment, but we have no means of determining what these charges should be at Gary. This report, therefore, treats each of these several items of expense, with the exception of allowances for depreciation and charges on capital invested. But we are concerned chiefly with the operation cost of the Gary schools, and it is important to make clear at the outset what this includes. As we use the term, operation cost covers upkeep (that is, repairs and replacements), and current expenses other than upkeep, but does not include fixed charges.

The current expenses of the entire Gary system for the school year 1915-1916 were $255,438.41. This amount was distributed as follows:

---

[1] Cost should be distinguished from expenditures, for a report of expenditures would also cover debt payments.

TABLE I[1]

CURRENT COST OF THE ENTIRE SYSTEM

ORGANIZATION DIVISIONS	EXPENSES OTHER THAN UPKEEP	UPKEEP	TOTAL	PER CENT. OF TOTAL
Administrative and General Services[2]......	$ 21,047.72	$ 630.27	$ 21,677.99	9
Day School......	166,841.30	15,163.09	182,004.39	71
Saturday School..	12,427.45		12,427.45	5
Night School.....	22,641.76		22,641.76	9
Summer School...	13,544.64		13,544.64	5
Sunday School...	3,142.18		3,142.18	1
Total.........	$239,645.05	$15,793.36	$255,438.41	100

[1] This table is based on Table H of the Appendix.

[2] Administrative and General Services include the Board of Education, the Superintendent, Supervision of Heat and Power Plants, Attendance Enforcement, Medical Inspection, etc.; in short, items which it is customary to report under General Administration. See Schedule H-1 of the Appendix.

A review of the total current expenses of a system is not only interesting but yields the perspective needed if judgment is to be passed on the expenditure for any single kind of school. But at Gary, as elsewhere, the day schools are the heart of the system, the direct cost amounting to 71 per cent. of the total current expenditure for public education. For this reason, and because of the widespread popular interest, the analyses and discussions of this report center chiefly on the operation cost of the Gary day schools. However, other types of schools are considered incidentally, and the appendix supplies detailed financial data on each branch of the system.

III. CURRENT COST OF REGULAR DAY SCHOOLS

ALTHOUGH we shall shortly question its propriety, common practice charges the entire cost of administrative and general services (which includes the expense of the board of education, the superintendent, and the like) against the day school. If, then, $21,677.99, the current expenditure for administrative and general services, be added to $182,004.39, the direct operating cost of the day school (Table I), the total current day school expense becomes $203,682.38. This is equal to a current expense of $49.29 per pupil in average daily attendance (4,132), or of $36.02 per pupil on total enrollment (5,654). The per pupil expense in average daily attendance may be divided as in Table II.

Each item of Table II requires analysis and comment, but before we undertake this, it is necessary to explain the difference in the reported expenditures under Administrative and General Services as given in Table I ($21,677.99) and in Table II ($36,046.55). Administrative and General Services in Table I include the overhead for the system as a whole. In contrast, Administrative and General Services in Table II include the

TABLE II

DIVISION OF EXPENSE PER PUPIL IN AVERAGE DAILY ATTENDANCE AT REGULAR DAY SCHOOLS

SERVICES	TOTAL EXPENDITURE	PER PUPIL EXPENSE	PER CENT. OF TOTAL
A. Administrative and General Services	$36,046.55	$ 8.72	17.7
1. Administration:			
(1) The Board[1]	4,853.79	1.17	2.4
(2) The Superintendent[1]	7,640.14	1.85	3.7
(3) Supervision:			
(a) Of Property[1]	1,821.75	.44	.9
(b) Of Instruction[2]	7,462.42	1.81	3.7
(4) Principals[2]	6,906.14	1.67	3.4
(5) Total	28,684.24	6.94	14.1
2. General Services:			
(1) Provision and Storage of Supplies[1]	681.12	.16	.3
(2) Transportation Service[1]	654.88	.16	.3
(3) Compulsory Attendance[1]	730.84	.18	.4
(4) Medical Inspection[1]	5,009.74	1.21	2.5
(5) Library Service[1]	18.70	.07	.1
(6) Instruction in Other Institutions[1]	267.03		
(7) Total	7,362.31	1.78	3.6
B. Operation and Maintenance of Plant	39,633.45	9.59	19.5
1. Operation of Buildings and Grounds[2]	26,423.27	6.39	13.0
2. Upkeep of Buildings, Grounds, and General Equipment[2]	13,210.18	3.20	6.5
C. Instruction	128,002.38	30.98	62.8
1. Teachers' Salaries[2]	120,652.20	29.20	59.2
2. Supplies and Equipment Upkeep[2]	7,350.18	1.78	3.6
D. Grand Total	$203,682.38	$49.29	100.

[1] All items marked "1" are from Schedule H-1 of the Appendix.

[2] All items marked "2" are from Schedule H-2 of the Appendix.

overhead expenditures for the system as a whole, and also the direct overhead of the day schools (expenditures for day school supervision and principals), and presents the total as the overhead of the day school.

ADMINISTRATION

An expense per pupil in average daily attendance of $6.94 for administration (Table II) is higher than is generally reported for such service. However, before judgment is passed the services covered should be carefully scrutinized. Administration, as the term is employed here, draws a clear line between the services of those who direct and control the work of others, and the services of those actually engaged in doing things, whether it be running a boiler or teaching a class. On the basis of this division, this report includes under administration services not ordinarily covered (for example, supervision), and omits other services ordinarily included (such as compulsory attendance and medical inspection). Therefore, when the per pupil expense for administration is reported as $6.94, it should be understood that this covers all services having to do with the direction and control of the day schools, whether the legislative direction and control of the board of education, the executive direction and control of the superintendent, the supervisory control of property or instruction, or the managerial direction and control of school principals. For this reason, it is not out of place to caution against hasty comparisons of administration cost.

It is equally important before passing judgment to understand how expense charges are made; that is, whether the day schools carry the entire expense of a given kind of administrative service or only a part of it.

For example, the board of education and the superintendent direct and control the day schools, but they perform a like service for the Saturday schools, the night schools, the summer schools, and the Sunday schools. Nevertheless, the Gary auditor charges the totals of all such expense—as is the common practice—against the day school. Hence, the reported expenses of the board and of the superintendent of schools (Tables II and III) are the totals for these purposes.

Certain public school accountants hold that it is unfair to charge the entire expense of the board and superintendent against the day school, on the ground that such expenses should be apportioned among the different types of schools. While we agree with this position in theory, we have not seen any satisfactory basis for such distribution—whether the proposed basis is the total direct cost of the several activities, or teacher instruction hours,[1] or pupil instruction hours.[2] Therefore,

---

[1] A teacher instruction hour is a clock hour's service on the part of a single teacher.

[2] A pupil instruction hour is the reception on the part of a single pupil of a clock hour's instruction.

The pupil instruction hours, exclusive of the Sunday schools, rendered by the different branches of the service in 1915-1916, were:

Day schools . . .	5,515,575	Summer schools . .	80,465
Saturday schools . .	106,978		
Night schools . . .	167,984	Total	5,871,002

TABLE III

Administrative Expense

SERVICE	CURRENT EXPENSES							TOTAL	EXPENSE PER PUPIL IN AVERAGE DAILY ATTENDANCE
	OTHER THAN UPKEEP AND DEPRECIATION				UPKEEP OF PROPERTY				
	SALARIES AND WAGES								
	OFFICIALS AND EXECUTIVES	ASSISTANTS AND OPERATIVE FORCE	OTHER EXPENSES	TOTAL	REPAIRS TO BUILDINGS AND GROUNDS	REPAIRS TO EQUIPMENT	TOTAL		
The Board:									
Board Members[1]	$ 443.75	$485.77	$1,064.64	$1,994.16				$1,994.16	$ .48
Staff Service[1]:									
Accounting and Reporting .	1,320.00	664.90	210.21	2,195.11		$230.84	$230.84	2,425.95	.59
Legal Service... ...	318.10		24.16	342.26				342.26	.08
Treasurer ..			91.42	91.42				91.42	.02
The Superintendent[1]....	6,000.00	485.77	1,141.87	7,627.64		12.50	12.50	7,640.14	1.85
Supervisors:									
Supervision of Property[2] ..	1,800.00		21.75	1,821.75				1,821.75	.44
Supervision of Instruction[2].	6,575.00	448.15	423.27	7,446.42		16.00	16.00	7,462.42	1.81
Principals[2].....	6,030.00	546.94	321.02	6,897.96		8.18	8.18	6,906.14	1.67
Total	$22,486.85	$2,631.53	$3,298.34	$28,416.72		$267.52	$267.52	$28,684.24	$6.94

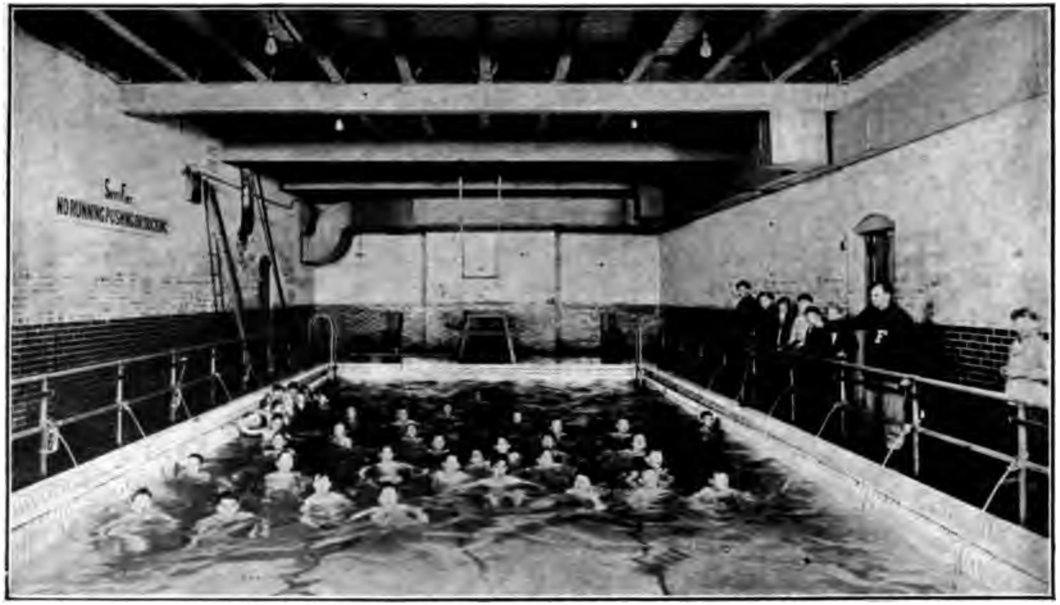
[1] All items marked "1" are from Schedule H-1 of the Appendix.

[2] All items marked "2" are from Schedule H-2 of the Appendix.

until an appropriate basis of distribution is experimentally determined it is altogether proper, we believe, either to treat the expenses of the board and of the superintendent as an overhead charge against the entire system, or to debit such expenses—as is now the common practice as well as the practice at Gary—against the day school.

The Gary authorities likewise charge the entire expense of property supervision against the day school. That is, the 44 cents per pupil for property supervision (Tables II and III) represents the total amount spent on this service, which at Gary has to do with the oversight of heat and power plants only. Since several kinds of schools use the same heat and power equipment, it would seem proper to apportion such supervision among the different organizations occupying the same building. But an equitable distribution of such expense is now, as we shall see in connection with the operation and upkeep of buildings, next to an impossible task. At any rate, we have made no attempt to apportion it, leaving the entire expense of property supervision against the day school as debited by the Gary authorities.

The expense of instructional supervision is, however, handled differently. The $1.81 per pupil for instructional supervision (Tables II and III) is only such part of the total expense for the system as the Gary authorities have charged or apportioned to the day school. In fact, the contracts of the supervisors are so drawn as to divide this expense. For example, the director of



Swimming Pool—Froebel School

night schools is also engaged for part day and full Saturday service; another is employed for regular day, Saturday, and evening schools; and still others, for the day school only. Again, supervisors are guaranteed work beyond what their contracts call for, and they receive additional pay for what they do. To illustrate: B's contract is for the day and Saturday schools at a salary of $2,000, which is apportioned $1,800 to the day school and $200 to the Saturday school. But B works also in the summer, earning $408 (Table IV). Similarly, D's regular day school salary is $1,100, but Saturday, evening, summer, and Sunday service raises the total to $1,964. As a result of so employing supervisors and of so distributing their salaries, only $7,462, or 67 per cent. of the total for supervision, is chargeable to the day school.[1]

The growing diversity of public education furnishes good reasons for engaging supervisors for specific tasks and for dividing the cost on a service base. But the respective charges at Gary—67 per cent. to the regular day school, 8 per cent. to the Saturday school, 8 per

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[1] Supervisors receive pay only for what they do in the summer and Sunday schools. This also holds for the Saturday and night schools in the case of supervisors C and D. The salaries and expenses of the remaining three are apportioned as follows:

SUPERVISORS (SEE TABLE IV)	DAY SCHOOL	SATURDAY SCHOOL	NIGHT SCHOOL
A* (theoretically)	33¾%	3¾%	....
B	90 %	10 %	....
E	70 %	10 %	20%

*A receives theoretically 62½ per cent. of his salary as director of night school.

TABLE IV[1]

DISTRIBUTION OF TOTAL INSTRUCTIONAL SUPERVISION EXPENSE

SUPERVISORS	TOTAL SALARIES	PART CHARGED AGAINST OR APPORTIONED TO:				
		DAY SCHOOL	SATURDAY SCHOOL	NIGHT SCHOOL	SUMMER SCHOOL	SUNDAY SCHOOL
"A".......	$1,812.49	$1,125.00	$125.00		$ 562.49	
"B".......	2,408.34	1,800.00	200.00		408.34	
"C".......	1,150.00	1,150.00				
"D".......	1,964.79	1,100.00	184.25	$362.00	263.54	$55.00
"E".......	2,508.34	1,400.00	200.00	400.00	508.34	
Total.......	$9,843.96	$6,575.00	$709.25	$762.00	$1,742.71	$55.00
Wages of Office Force.......	693.79	448.15	66.18	98.39	81.07	
Supplies and Other Expenses......	658.73	439.27	67.33	64.41	87.72	
Grand Total	$11,196.48	$7,462.42	$842.76	$924.80	$1,911.50	$55.00
Per cent. of Total		66.6	7.5	8.3	17.1	0.5

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[1] This table is based on Schedules H-2, H-3, H-4, H-5, and H-6 of the Appendix.

cent. to the night school, and 17 per cent. to the summer school (Table IV)—suggest either inadequate provision in some directions, or an unequal distribution.

The differences in cost for the same unit of supervisory service in the several branches of the service point to the latter view. For when supervision expense as now distributed is compared on the basis of teacher instruction hours, supervision costs 5.0 cents per teacher instruction hour in the regular day school; 13.4 cents in the Saturday school; 9.3 cents in the night school; and 26.4 cents in the summer school.[1] (Table V.)

These differences are striking. Yet the comparison can hardly be called unfair. There are enough teachers[2] in any one of these different kinds of schools to consume the full time of a supervisor, so that the cost of a reasonable amount of supervision in any type of school should not be unusual.

Under these conditions, it is certainly difficult to justify a relatively higher expenditure for Saturday and summer school supervision, where instruction is chiefly drill and review, than for regular day school supervision. Besides, summer service on the part of supervisors is regarded in most systems as essential to the efficiency of the regular day school, and is provided for as part of their regular service and pay. During the vacation months, plans are matured and materials prepared, in

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[1] Teacher instruction hours are taken as the basis of comparison, for the reason that supervisors deal principally with teachers.

[2] See The Gary Public Schools: A General Account.

TABLE V

COST PER TEACHER INSTRUCTION HOUR FOR SUPERVISION

	DAY SCHOOL	SATURDAY SCHOOL	NIGHT SCHOOL	SUMMER SCHOOL	SUNDAY SCHOOL
Total Supervision Charge	$7,462.42	$842.76	$924.80	$1,911.50	$55.00
Teacher Instruction Hours	150,594	6,293	9,896	7,253	
Per Teacher Instruction Hour Cost	5.0c.	13.4c.	9.3c.	26.4c.	

order that supervision may not suffer during the regular school time. The wording of the contracts with the supervisors does not really alter the fact that the practice at Gary conforms to common usage. As elsewhere, the day school is the arch of the system, and to the policies and practices of the day school, supervisors give the lion's share of their energies during both the regular school year and the summer.

In any case it is not apparent why supervision should not be provided in the different types of schools at approximately the same cost per teacher instruction hour rate. Were this done, the amounts now charged to the different schools would be materially altered. To illustrate: Should the total now spent on supervision, exclusive of the charge against the Sunday school, be distributed among the various branches of the system on the basis of the present average cost per teacher instruction hour for supervision (6.4 cents), $9,640.76, or 86 per cent. of the entire expenditure, would go to the regular day school (Table VI), and the per pupil cost of day school supervision would become $2.33 instead of $1.81, as reported above.

The Gary authorities pursue a similar method in charging and apportioning the salaries of school principals. In the first place, the contracts of principals and supervisors are much alike. Those of the principals call for full week-day service and salaries are apportioned 90 per cent. to the regular day and 10 per cent. to the Saturday school. Summer service is guaranteed

TABLE VI

REDISTRIBUTION OF TOTAL SUPERVISION EXPENSE ON BASIS OF AVERAGE PER TEACHER INSTRUCTION HOUR RATE (6.4 CENTS)

	DAY SCHOOL		SATURDAY SCHOOL		NIGHT SCHOOL		SUMMER SCHOOL		SUNDAY SCHOOL	
	Amount	Per cent. of Total	Amount	Per cent. of Total	Amount	Per cent. of Total	Amount	Per cent. of Total	Amount	Per cent. of Total
Original Charge	$7,462.42	66.6	$842.76	7.5	$924.80	8.3	$1,911.50	17.1	$55.00	.5
Redistributed Charge......	9,640.76	86.1	402.87	3.6	633.53	5.7	464.32	4.1	55.00	.5

besides, and there is also opportunity for night work. To illustrate: Of A's regular salary, $2,000, $1,800 is charged to the day and $200 to the Saturday school; while the summer netted him $370. Again, D earned a total of $1,422, apportioned and charged as follows: day school, $990; Saturday school, $110; night school, $104; and summer school, $218.[1] (Table VII.)

Sound business policy requires the division of managerial expense among the different organizations operating in the same building. Where the personnel of the management is the same in the regular day, Saturday, and summer schools, as it is at Gary, the cost for the same unit of similar service ought not to vary greatly for the different organizations. But as apportioned and charged at Gary, building management costs, per 100 pupil instruction hours, 12½ cents in the regular day schools, 74 cents in both Saturday and night schools, and $1.57 in the summer schools. These radical differences suggest that the charge against the Saturday and summer schools is too heavy, thus lessening the load of the regular day schools.

Experience may demonstrate that the pupil instruction hour is not a fair base on which to apportion build-

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[1] Supplies and clerical assistance are in part charged direct and in part apportioned. For example, summer school supplies are charged to the summer schools; all others are apportioned, 80 per cent. to the day schools, 10 per cent. to the Saturday schools, and 10 per cent. to the night schools. Clerical assistance for night and summer schools is charged direct, but that for the day and Saturday schools is divided 90 per cent. to the one and 10 per cent. to the other.

TABLE VII[1]

DISTRIBUTION OF TOTAL EXPENSE FOR PRINCIPALS

PRINCIPALS	TOTAL	DAY SCHOOLS	SATURDAY SCHOOLS	NIGHT SCHOOLS	SUMMER SCHOOLS
A.	$2,870.84	$1,800.00	$200.00		$ 370.84
B.	2,335.00	1,800.00	200.00		335.00
C.	1,570.83	1,170.00	130.00		270.83
D.	1,422.75	990.00	110.00	$ 104.00	218.75
E.	100.00	90.00	10.00		
F.	100.00	90.00	10.00		
G.	100.00	90.00	10.00		
Others	1,010.00			1,010.00	
Total	$ 9,009.42	$6,030.00	$670.00	$1,114.00	$1,195.42
Wages of Assistants	715.72	546.94	60.66	43.75	64.37
Other Expenses	471.40	329.20	60.50	81.70	
Grand Total.	$10,196.54	$6,906.14	$791.16	$1,239.45	$1,259.79
Per cent. of Total		67.7	7.8	12.2	12.3

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[1] This table is based on Schedules H-2, H-3, H-4, and H-5 of the Appendix.

ing administration expense. Yet in the absence of scientific proof to the contrary, there is much to commend it. Should the average total building administration expenditure in all branches of the system for each 100 pupil instruction hours (17.4 cents) be used as the base for redistributing the total spent during 1915-1916 on principals, $9,579, or 94 per cent., would be charged to the regular day school, where our experience with principals convinces us that it belongs; for, although on duty Saturdays and during the summer, principals are at all times engrossed chiefly in regular day school problems. But so to redistribute the cost of managerial direction and control would raise the per pupil cost for principals from $1.67, as now reported (Tables II and III), to $2.32.

GENERAL SERVICES

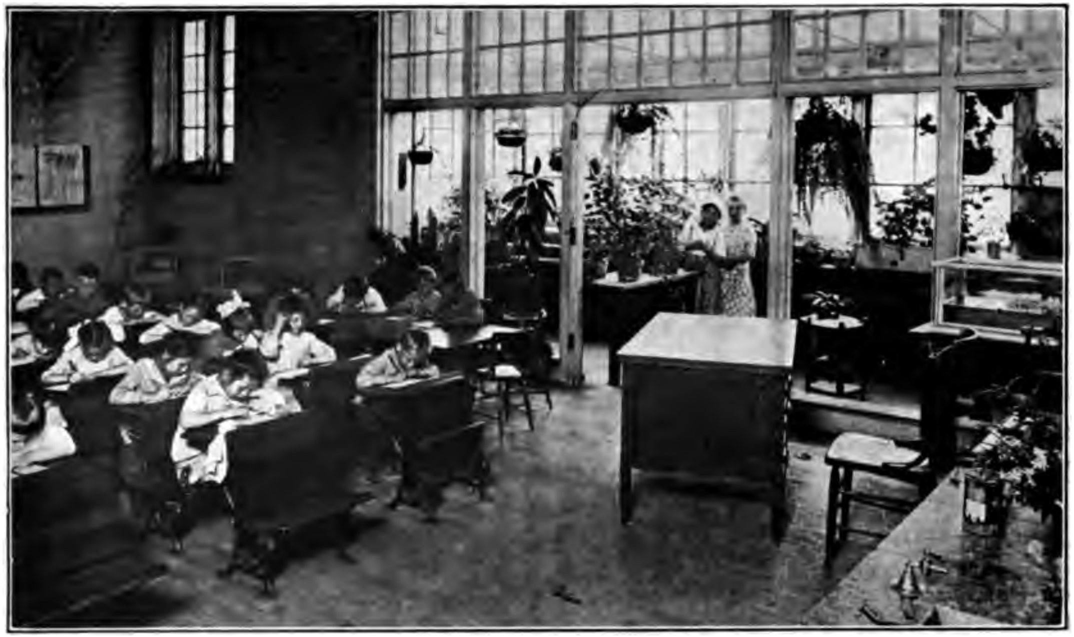
As pointed out before, we have grouped all overhead expenditures, other than expenditures for administration, under General Services. Of these overhead charges, it is enough to say that, with the exception of the items Provision and Storage of Supplies, and Transportation, the reported expenditures (Table II) are the totals for these purposes. In the case of Provision and Storage of Supplies, and Transportation, the reported amounts are the undistributed balances after all legitimate charges against specific organizations have been made.

The only item requiring special comment is the 18 cents per pupil for Attendance Enforcement (Table II), which is unusually small. Taking the country as a whole, attendance enforcement is a local matter, for which the local school organization bears the entire expense. In Indiana, however, attendance enforcement is largely a county affair, the county paying the bulk of the cost. Accordingly, Gary is at little expense for compulsory attendance, the total expenditure for 1915-1916 amounting to $730. Even this sum includes $485 allowed to principals as a special fund on the ground that teachers make the annual school enumeration. In fact, the salary and contingent expenses of the attendance officer paid by Gary aggregated only $245; this is, of course, in addition to what he receives from the county. Nothing could show more clearly than this simple item of attendance enforcement the danger of making cost comparisons between various cities unless the person making the comparison is familiar with the service, the conditions under which it is rendered, and how it is financed in the different cities compared.

OPERATION OF BUILDINGS AND GROUNDS

If we now turn to other than overhead expenditures, we find an even greater variety of ways of making charges and we also perceive that in a complex system such as that of Gary it is extremely difficult to report with exactness the actual cost of specific services. This is well illustrated in the attempt to determine the cost of plant operation.

The per pupil building and ground operation cost is



Nature Study Room—Froebel School

reported as $6.39 (Table II). This covers the usual items of personal service, such as engineers and janitors, and also fuel, water, light, supplies, and miscellaneous expenses. (Table VIII.) But this amount does not represent the direct expenditure in respect to these objects for the day schools; it is merely an estimate of the portion of the total expense of building and ground operation that the day school should bear.

The necessity of apportioning such expenses arises from the fact that each large building houses a number of separate school organizations. For example, the Emerson building shelters four kinds of schools; but there is only one coal-bin, one water-meter, and one gas-meter. Even under these circumstances, some operation expenditures become a direct debit against particular activities; for the most part, however, expenses incurred must be apportioned. Obviously, the reliability of the apportionment depends on the care and judgment exercised; obviously, good public school accounting depends not only on having well-determined bases of apportionment, but also on having proper classification of expenditures.

Generally speaking, building operation expenditures at Gary are apportioned on the basis of the relative amount of time each kind of school uses each plant. These proportions differ with the building, owing to the different uses to which the various plants are put. (Table IX.) For example, at Emerson the theoretical base (with the summer school excluded) was, for 1915-

TABLE VIII[1]

EXPENSE OF OPERATING BUILDINGS AND GROUNDS

KIND OF SERVICE	WAGES OF OPERATIVE FORCE	FUEL	WATER	GAS AND ELECTRICITY	OTHER OPERATING SUPPLIES	MISCELLANEOUS EXPENSE	TOTAL	PER CENT. OF TOTAL	PER PUPIL COST
Care of Grounds......	$ 1,631.28				$ 23.05	$ 2.00	$ 1,656.33	6.3	$ .40
Heat, Light, and Power Service............	3,935.11	$7,735.84		$522.69	437.52	70.53	12,701.69	48.0	3.07
Janitorial Service.....	8,081.80				1,781.34	543.95	10,407.09	39.4	2.52
Other Building Service			$1,571.75			86.41	1,658.16	6.3	.40
Total.............	$13,648.19	$7,735.84	$1,571.75	$522.69	$2,241.91	$702.89	$26,423.27	100.	$6.39
Per cent. of Total.....	51.6	29.3	5.9	2.0	8.5	2.7			

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[1] This table is based on Schedule H-2 of the Appendix.

1916, 56 per cent. to the day school, 12 per cent. to the Saturday school, 20 per cent. to the night school, and 12 per cent. to the Sunday school. In contrast, at Jefferson 72 per cent. went to the day school, 10 per cent. to the Saturday school, and 18 per cent. to the night school.

TABLE IX

THEORETICAL BASES (1915-1916) FOR DISTRIBUTING PLANT OPERATION COST, EXCLUSIVE OF THE SUMMER SCHOOL

PLANT	TO THE DAY SCHOOL	TO THE SATURDAY SCHOOL	TO THE NIGHT SCHOOL	TO THE SUNDAY SCHOOL
Emerson	56%	12%	20%	12%
Froebel	56%	12%	20%	12%
Jefferson	72%	10%	18%	
Beveridge	80%	12%	8%	
Glen Park	80%	12%	8%	
Other Schools	85%	10%	5%	

These bases of apportionment are called theoretical, because they do not conform to the actual use of buildings and because in actual accounting there are numerous deviations from them. (Table X.) For example, engineers and janitors are, as a rule, paid direct for night and Sunday work, which leaves only their regular wages to be divided between the day and Saturday schools, generally 87½ per cent. to the one and 12½ per cent. to the other. Again, in some schools 10 per cent. of the water expense is charged to the summer school and the balance is apportioned 72 per cent. to the day, 10 per cent. to the

TABLE X[1]

PLANT USE OF DIFFERENT KINDS OF SCHOOLS[1]

PLANT	NUMBER OF DAYS OR NIGHTS IN SESSION, SCHOOL YEAR 1915-1916					
	DAY SCHOOL	SATURDAY SCHOOL	NIGHT SCHOOL	SUMMER SCHOOL	SUNDAY SCHOOL	PLAYGROUNDS, GYMNASIUMS, AND POOLS
Emerson	195	35	112	40	35	346
Froebel	195	35	140	40	35	346
Jefferson	195	35	112	40		
Beveridge	195	35	56	40		
24th Avenue	195	35		40		
Glen Park	195	35	56	40		
Ambridge	195	35	28	40		
West Gary	195					
Clarke	195			20		

[1] Day schools, Saturday schools, and summer schools at Emerson, Froebel, Jefferson, Beveridge are in session eight hours; at all other schools, seven hours; night schools are in session two hours, and Sunday schools, four hours.

Saturday, and 18 per cent. to the night school. At other buildings, for example, Emerson and Froebel, water charges are divided 50 per cent. to the day, 12 per cent. to the Saturday, 20 per cent. to the night, 12 per cent. to the Sunday, and 6 per cent. to the summer school. The result is that the reported plant operation expenditures for the day schools—and for all schools, for that matter—are made up of two classes of items, direct charges for specific services and charges made after the cost of the service is divided among a few or all of the different kinds of schools. The amount and the per cent. of the total plant operation expenditures actually charged and apportioned at each plant to each kind of school were as in Table XI.

To apportion plant operation expenditures is in the highest degree difficult. For example, how shall the coal bill be divided? Modern school buildings must be kept at all times above the freezing point, whether or not there is a Saturday or night or Sunday school. What is the additional fuel cost to raise the temperature to the point of comfort for these activities? The wages of engineers and janitors are equally difficult to handle. Ordinarily, engineers and janitors are hired by the month or by the year, working six or seven days a week. They use Saturday for general cleaning and minor repairs, and must keep the fires under their boilers on Sunday; during the summer they are busy overhauling buildings and equipment. When Saturday and summer schools are inaugurated, shall the wages of engineers and janitors,

TABLE XI[1]

DISTRIBUTION OF TOTAL PLANT OPERATION EXPENSE

PLANT	DAY SCHOOL		SATURDAY SCHOOL		NIGHT SCHOOL		SUMMER SCHOOL		SUNDAY SCHOOL		TOTAL
	Amount	Per cent.	Amount	Per cent.	Amount	Per cent.	Amount	Per cent.	Amount	Per cent.	
Emerson......	$ 8,934.50	62	$1,505.78	10	$1,733.42	12	$1,190.25	8	$1,135.55	8	$14,499.50
Froebel........	10,322.57	60	1,838.78	11	2,318.20	13	1,379.17	8	1,366.05	8	17,224.77
Jefferson.......	1,843.36	67	319.29	11	414.89	15	184.17	7			2,761.71
Other Schools...	5,322.84	79	678.23	10	492.83	7	259.26	4			6,753.16
All Schools.....	$26,423.27	64	$4,342.08	11	$4,959.34	12	$3,012.85	7	$2,501.60	6	$41,239.14

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[1] This table is based on Schedules H-2, H-3, H-4, H-5, and H-6 of the Appendix.

as is the common practice, be charged entirely against the day schools, or shall, as at Gary, their salaries for two months be charged to the summer schools, and a sixth of their wages for the remaining ten months be debited to the Saturday schools? No satisfactory answer is at hand to these and other questions.

At all events, experience has demonstrated that plant operation expenditures cannot be apportioned equitably, at least at Gary, on the base of plant instruction hour use. This base equalizes, for all kinds of schools, plant instruction hour cost, irrespective of whether the school is conducted in the daytime, at night, in the winter, or in the summer. Obviously, the cost is not the same. Summer schools burn little or no fuel, day schools do not use as much light as night schools, nor do the different kinds of schools require an equal amount of janitorial service. The Gary authorities, therefore, in apportioning operation cost, make many departures from the single base of plant instruction hour use, although they adopt it as their guide.

To apportion plant operation expenditures on the base of pupil instruction hours would hardly prove more satisfactory. This base emphasizes attendance but ignores the fact that there are elements of cost in heating, lighting, and caring for a plant altogether independent of the number of pupils in attendance; hence, this base tends to lessen the operation burden of auxiliary activities and to overload the day school.

If a single base of distribution is to be employed, room instruction hour use has much to commend it. In the first place, it minimizes attendance, so prominent in the pupil instruction hour base, and, in the second place, it distributes, in contrast to the plant instruction hour base, the operation cost in view of the portion of the plant actually employed. Nevertheless, we hesitate to reapportion the building operation expenditures at Gary even on this base

Ten months' contact with Gary conditions and test tabulations incline us to the opinion that no single basis of apportioning plant operation expenditures will prove satisfactory. The solution lies, we believe, in developing for each plant, depending on the uses to which it is put, a number of bases built up around room instruction hour use; for example, one base for heat and another for light, one for engineers and still another for janitors, and so on for each major item of operation expenditure; but the derivation of such bases must await cost accounting and detailed data on the time, pupil, teacher, and room use of buildings by the different school organizations.

TABLE XII

PLANT INSTRUCTION HOUR OPERATION COST

PLANT	DAY SCHOOL	SATURDAY SCHOOL	NIGHT SCHOOL	SUMMER SCHOOL	SUNDAY SCHOOL
Emerson..........	$5.73	$5.38	$7.74	$3.72	$8.11
Froebel...........	6.62	6.57	8.28	4.31	9.76
Jefferson..........	1.18	1.14	1.85	.58	

The success of the Gary authorities in apportioning plant operation expenditures can probably be best judged from a comparison of building instruction hour operation cost charged at the largest plants against each school organization. These charges for 1915-1916 were as in Table XII.

UPKEEP OF BUILDINGS, GROUNDS, AND GENERAL EQUIPMENT

In contrast with the method of handling plant operation cost, the Gary authorities have never attempted to apportion upkeep expenditures. To be sure, upkeep bills were formerly debited, when paid, to the day or to the summer school, according as the one or the other was in session; but this practice is now abandoned, as it should be, so that all upkeep expenses are charged to the day schools, and the reported $3.20 per pupil cost (Table II) is the total expenditure for 1915-1916. (Table XIII.)

But this $3.20 per pupil upkeep cost does not represent direct cash outlay. Repairs and replacements at Gary are inseparably bound up with the school shops. As pointed out elsewhere,[1] the school shops do real work. They have the first chance on all repairs and replacements, and are paid (credited) for what they do as if they were privately owned and conducted. What actually happens is: A shop undertakes a repair job, against which is charged the cost of materials used and the

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[1] In the volume dealing with Industrial Work.

TABLE XIII[1]

Upkeep of Buildings, Grounds, and General Equipment Expense

KIND OF SERVICE	REPAIRS TO GROUNDS	REPAIRS TO BUILDINGS AND PLANTS	REPAIRS TO PLANT EQUIPMENT	TOTAL	PER CENT. OF TOTAL	PER PUPIL COST
Care of Grounds.............	$498.20		$ 242.21	$ 740.41	5.6	$ .18
Heat, Light and Power Service		$ 4,021.35	143.02	4,164.37	31.5	1.01
Janitorial Service............			136.64	136.64	1.1	.03
Care of Land, Buildings, and General Equipment.........		7,533.50	635.26	8,168.76	61.8	1.98
Total....................	$498.20	$11,554.85	$1,157.13	$13,210.18		$3.20
Per cent. of Total............	3.8	87.5	8.7			

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[1] This table is based on Schedule H-3 of the Appendix.

time (paid for at the union rate) it takes the instructor to do it himself, or his estimate of the time it would take him even when pupils do the work.[1] The shop is then credited with this amount and a corresponding debit entered against upkeep. Accordingly, there is no little uncertainty as to actual upkeep expenditures[2] or what these would be, were repairs and replacements made as in conventional systems.

Even if the reported $3.20 per pupil upkeep expenditure is the actual cost to Gary, there is no good reason why this should all be borne by the day schools. Unquestionably, Saturday schools, night schools, etc., involve additional wear and tear of grounds, buildings, and general equipment. There are, however, no approved bases of distribution. Time and use are, of course, the two chief factors in deterioration. For practical purposes, time may be eliminated, leaving only use to be considered. Thus considered, upkeep cost for each building might be apportioned on the basis of plant instruction hour use, or on the basis of pupil instruction hours, or on the basis of room instruction hour use. The first ignores difference in wear and tear due to differences in attendance, and the second disregards deterioration due merely to opening up a plant. The last or room instruction hour base has some advantages. It equalizes differences in wear and tear from attendance, and it takes account, at least to a certain extent, of the deteriorating effects of putting a plant into operation. For these reasons, it appears to be the preferable base. But if used at all, it should be employed advisedly, for no apportionment basis can be confidently employed until its worth has been scientifically demonstrated.

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[1] Methods of determining shop production cost and of making credits and charges are discussed fully in the chapter on Shop Cost.

[2] This is also partially true of operation and capital outlay expenditures, for the shops furnish operation supplies and work on new construction as well.

On a room instruction hour basis of distribution, the regular day school would carry, even when the Sunday school is eliminated, only 87 per cent. of the upkeep burden,[1] and the per pupil upkeep cost would be $2.77 instead of the reported $3.20.

INSTRUCTION: TEACHERS' SALARIES

As in other systems, the largest single item of expense is teachers' salaries, amounting at Gary to 59 per cent. of the total. (Table II.) However, the reported expenditure of $29.20 per pupil in average daily attendance is not an out and out cash outlay, for even here we are not free from divisions and apportionments, involving complicated accounting problems. (Table XIV.)

For example, at Glen Park the manual training teacher's salary is first divided equally between instruction and plant operation. Plant operation carries a half, for the reason that the instructor is expected, through the boys whom he trains, to keep the boilers of the six-room building going during the day. The instruction burden, already halved, is further reduced by credits for production. The result is that out of a regular annual salary of $1,000 only $418 is charged against instruction.

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[1] The basis of this distribution was in fact teacher instruction hours, which differs at most only slightly from room instruction hours.

At Jefferson and Beveridge the practice is reversed—custodians become teachers. To illustrate: At Jefferson the custodian's wage is divided one part to plant operation and two to instruction; this latter debit is made on the ground that the custodian at times looks after boys in the shop and also teaches them how to run the engine and to care for the boiler. The instruction charge is next subdivided, five-sixths to the day and one-sixth to the Saturday school, to be reduced in each case by production credits. Accordingly, the final disposition of this custodian's total wage ($1,034.45) is: $283.44 as custodian, divided among the day, Saturday, and night schools; $423.15 as day school teacher; $24.57 for Saturday instruction; and $303.29 against upkeep and capital outlay.

It is not worth while to attempt to unravel this tangled skein to show how these salaries and wages would be apportioned on a strict work-time basis, for there are also far-reaching practical and educational policies involved. It suffices for our purpose to call attention to this practice as a factor that affects instruction cost.

The method of handling the wages of shopmen also requires examination. The shopmen at Gary are not licensed teachers; with few exceptions, they are journeymen accustomed to work and to receive pay for six days

TABLE XIV[1]

INSTRUCTION: TEACHERS' SALARIES, SUPPLIES, AND EQUIPMENT UPKEEP

KIND OF SERVICE	GENERAL AND OPERATION EXPENSES			UPKEEP OF EQUIPMENT	TOTAL
	SALARIES OF TEACHERS	INSTRUCTIONAL SUPPLIES	OTHER EXPENSES		
General Instruction	$ 78,001.07	$ 759.01	$ 243.39	$ 165.60	$ 79,169.07
Commercial Instruction	2,286.25	14.02		255.00	2,555.27
Science Instruction:					
Nature Study	3,137.25	44.76	9.58	2.98	3,194.57
Physics	2,388.50	63.96		53.20	2,505.66
Chemistry	3,200.00	230.48		32.95	3,463.43
Botany	2,917.28	23.31	5.62	95.50	3,041.71
Zoology	2,859.17	71.15	61.36	100.03	3,091.71
Household Arts Instruction:					
Domestic Arts	2,153.75	43.51		8.55	2,205.81
Domestic Science	2,587.00	4.22	18.80	59.24	2,669.26
Industrial Arts Instruction:					
Manual Training	3,517.91	187.96	55.72	66.77	3,828.36
Mechanical Drawing	2,200.00	34.53	65.00		2,299.53

Cabinet Shop	138.08	51.33		37.30	226.71
Pattern Shop	105.91	24.99	2.81	126.17	259.88
Foundry	626.97	23.07	78.10	205.20	933.34
Forge Shop	380.92	98.26	76.76	61.00	616.94
Machine Shop	430.13	103.60	38.44	48.49	620.66
Plumbing Shop	113.02	91.51	3.31	8.00	215.84
Sheet Metal Shop	117.26	59.44	7.81	66.09	250.60
Paint Shop	63.40	80.31	7.92	9.87	161.50
Print Shop	780.58	97.76	41.41	54.62	974.37
Shoe Shop	551.67				551.67
Pottery	270.83	9.66			280.49
Physical Instruction	11,825.25	23.45	2,565.13	472.17	14,886.00
Total	$120,652.20	$2,140.29	$3,281.16	$1,928.73	$128,002.38

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[1] This table is based on Schedule H-2 of the Appendix.

a week. Where licensed teachers are similarly engaged, although they are busy Saturdays helping boys, caring for tools, and preparing materials, their salaries are debited to the day schools, but at Gary only five-sixths of all shop wages are so charged. The situation is further complicated by the use of productive shops and shop credits. In fact, the credits for production against manual training and shop instructors' time in 1915-1916 amounted to more than half of the total shop payroll, which, exclusive of mechanical drawing but including manual training, amounted for both regular and Saturday schools to $17,826.11,[1] leaving a net shop wage charge against the day schools of only $7,096.68,[2] and against the Saturday schools of $1,156.66.[3] Even if these final net charges are taken at their face value, it appears that manual and industrial instruction costs almost as much on Saturday as on a regular school day, an apportionment which can scarcely be justified in view of the difference between week-day and Saturday attendance.

Finally, it is necessary to keep in mind, when discussing instruction cost, that much of what is done in the Gary Saturday schools is accomplished elsewhere as a part of the regular day school work. To illustrate: In other cities lessons lost by absence are made up after school, and, besides classes for defectives and the tuber-

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[1] Table XIX.

[2] Schedule H-2 of the Appendix.

[3] Schedule H-3 of the Appendix.

Woodworking Shop—Froebel School

cular, there are often classes (usually small) for fast, slow, and backward children; also "coaches" in large buildings for groups and individuals requiring special assistance. The additional expenditures for these purposes are included in the day school cost, making it higher than it would be were most of such expense charged, as at Gary, against a Saturday school.

INSTRUCTION: SUPPLIES AND EQUIPMENT UPKEEP

A further element in instruction cost is the expenditure for instructional supplies and equipment upkeep, amounting to a per pupil charge of $1.78. (Table II.) The actual expenditure, however, for instructional supplies as this term is generally used aggregates only 52 cents per pupil. (Table XIV.) The smallness of this sum may come as a surprise, but it is to be remembered that it covers only the incidentals used by the teachers, including also paper and the like handed out by them to pupils for special written work and examinations.

The Gary authorities appreciate the desirability of providing all supplies and textbooks free of charge, but the Indiana law prevents. To overcome this obvious handicap, the teachers are allowed to collect from the children fees which are turned over to the principals, who buy the textbooks and other necessities called for by the course of study. These fees are not included in the reported cost of the Gary schools. The rates at which collections are made in any one year from the children are as follows:

Kindergarten	$ .00
Grades 1 and 2	.75
Grades 3 and 4	1.50
Grades 5, 6, 7, and 8	2.25
High School (all classes)	3.00

SUMMARY

To summarize: When the $49.29 current expense per pupil in average daily attendance in the regular day schools is thus analyzed and the make-up of the several expense items described, it becomes apparent that $49.29 is not an exact figure, but only an approximation. All that can be said is that this is the current operation expense per pupil in average daily attendance when computed according to the bases of distribution prevailing at Gary, with only minor deviations therefrom on our part. As to the wisdom and correctness of these distributions, opinion will differ. Exception may easily be taken to the way in which salaries of supervisors, principals, custodians, and shopmen are divided, or to the practice of charging the entire expense of building upkeep to the day schools, or to the manner in which certain other items are handled. Yet, after months of the minutest study of the Gary accounts, it is impossible, with the data at hand, to reconstruct them. For educational cost accounting is exceedingly complicated, and while necessity compels the apportionment of any number of items, there is not to-day a single generally accepted basis of distribution, nor is there unanimity of opinion as to the classification of expenses. In short, the whole field of public school cost accounting, at least for complex school systems, is undeveloped. For this reason we caution once more against cost comparisons either between totals or between specific services, unless it is positively known that the same methods of classification obtain, and that the division and apportionment of salaries, wages, and other expenses, ways of financing, and accounting methods are substantially identical.

IV. CURRENT COST OF LARGER DAY SCHOOLS

AS POINTED out elsewhere, Gary schools range from portables to large modern buildings.[1] The foregoing sections shed, therefore, little light on what a fully developed Gary system would cost. The nearest approach to an idea of such cost can be obtained from the Emerson, Froebel, and Jefferson schools. The respective current expense per pupil in average daily attendance in these schools, as operated in 1915-1916, was approximately as follows:

TABLE XV

CURRENT EXPENSE PER PUPIL IN AVERAGE DAILY ATTENDANCE AT EMERSON, FROEBEL, AND JEFFERSON SCHOOLS

SCHOOL	KINDERGARTEN	ELEMENTARY SCHOOL GRADES			HIGH SCHOOL	ALL GRADES
		1 to 5	6 to 8	1 to 8		
Emerson......	$46.83	$64.49	$74.58	$68.75	$90.80	$74.64
Froebel.......	40.17	48.51	57.54	50.29	79.22	52.37
Jefferson......	31.67	34.89	33.97	34.64		34.31

A more detailed statement shows wherein the operation expenses of these schools differ, and thus supplies the data for school to school comparison, also for comparisons between the cost of particular services in these schools and in the system as a whole.[1]

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[1] See report on Organization and Administration.

When considering the respective current costs of the Emerson, Froebel, and Jefferson schools, it should be borne in mind that Emerson—probably the best expression of the Gary idea—is working at hardly more than half capacity. This accounts in part for the present very high cost of plant operation, and may also affect somewhat the per pupil instruction cost, although the teachers now engaged appear to be fully occupied. Froebel is

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[1] In compiling the current cost of Emerson, Froebel, and Jefferson, the same difficulties were encountered with respect to the division and apportionment of salaries, wages, and expenditures as were met when considering the cost of the system as a whole. It would be unprofitable to reconsider these; suffice it to say that no redistribution was attempted. It is, however, necessary to call attention to the manner in which we handled particular items. In the case of the board, the superintendent, supervisors both of property and of instruction; transportation; provision and storage of supplies; instruction of pupils in other institutions; branch libraries; compulsory attendance enforcement; and medical inspection service, the cost per pupil in average daily attendance for the system was charged alike in each school against the kindergarten, elementary grade groups, and the high school. Managerial as well as plant operation and upkeep cost was handled in a like manner, except that here the per pupil cost for the building became the charge. Instruction cost was by far the most troublesome. As accounts are kept at Gary, there is no distinction between kindergarten, elementary, and high school. The same teacher, as a rule, has both elementary and secondary classes, and in the same class there are often different grades. Where it was necessary to apportion a teacher's salary, this was divided, when possible, on the basis of the instruction periods given to the classes of the elementary divisions or the high school; otherwise it was divided on the basis of the number of pupils in a class from each of the different grade groups. Finally, instructional supplies and equipment upkeep was apportioned on the basis of the relation of the present charges to the different grades for supplies and textbooks; in this compilation, the charge for the kindergarten was considered the same as the present charge for the first and second grades.

TABLE XVI[1]

CURRENT EXPENSE PER PUPIL IN AVERAGE DAILY ATTENDANCE AT EMERSON SCHOOL

SERVICES	KINDERGARTEN	ELEMENTARY SCHOOL GRADES			HIGH SCHOOL	ALL GRADES
		1 to 5	6 to 8	1 to 8		
A. Administrative and General Services	$10.05	$10.05	$10.05	$10.05	$10.05	$10.05
1. Administration:						
(1) Other Than Principal	5.27	5.27	5.27	5.27	5.27	5.27
(2) Principal	3.00	3.00	3.00	3.00	3.00	3.00
2. General Services	1.78	1.78	1.78	1.78	1.78	1.78
B. Operation and Maintenance of Plant	16.85	16.85	16.85	16.85	16.85	16.85
1. Operation of Buildings and Grounds	12.04	12.04	12.04	12.04	12.04	12.04
2. Upkeep of Buildings, Grounds, and General Equipment	4.81	4.81	4.81	4.81	4.81	4.81
C. Instruction	19.93	37.59	47.68	41.85	63.90	47.74
1. Teachers' Salaries	19.70	33.76	41.41	36.99	57.67	42.76
2. Instructional Supplies and Equipment Upkeep	.23	3.83	6.27	4.86	6.23	4.98
D. Grand Total	$46.83	$64.49	$74.58	$68.75	$90.80	$74.64

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[1] This table is based on Schedules H-1, H-2, and H-2-a of the Appendix. See also explanatory note, page 45.

TABLE XVII[1]

CURRENT EXPENSE PER PUPIL IN AVERAGE DAILY ATTENDANCE AT FROEBEL SCHOOL

SERVICES	KINDER-GARTEN	ELEMENTARY SCHOOL GRADES			HIGH SCHOOL	ALL GRADES
		1 to 5	6 to 8	1 to 8		
A. Administrative and General Services..	$ 8.48	$ 8.48	$ 8.48	$ 8.48	$ 8.48	$ 8.48
1. Administration:						
(1) Other Than Principal..........	5.27	5.27	5.27	5.27	5.27	5.27
(2) Principal....................	1.43	1.43	1.43	1.43	1.43	1.43
2. General Services.................	1.78	1.78	1.78	1.78	1.78	1.78
B. Operation and Maintenance of Plant.	10.28	10.28	10.28	10.28	10.28	10.28
1. Operation of Buildings and Grounds	6.87	6.87	6.87	6.87	6.87	6.87
2. Upkeep of Buildings, Grounds, and General Equipment...........	3.41	3.41	3.41	3.41	3.41	3.41
C. Instruction.......................	21.41	29.75	38.78	31.53	60.46	33.61
1. Teachers' Salaries................	21.32	28.18	36.01	29.72	56.15	31.70
2. Instructional Supplies and Equipment Upkeep................	.09	1.57	2.77	1.81	4.31	1.91
D. Grand Total......................	$40.17	$48.51	$57.54	$50.29	$79.22	$52.37

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[1] This table is based on Schedules H-1, H-2, and H-2-b of the Appendix. See also explanatory note, page 45.

TABLE XVIII[1]

CURRENT EXPENSE PER PUPIL IN AVERAGE DAILY ATTENDANCE AT JEFFERSON SCHOOL

SERVICES	KINDERGARTEN	ELEMENTARY SCHOOL GRADES			ALL GRADES
		1 to 5	6 to 8	1 to 8	
A. Administrative and General Services	$ 8.77	$ 8.77	$ 8.77	$ 8.77	$ 8.77
1. Administration:					
(1) Other Than Principal	5.27	5.27	5.27	5.27	5.27
(2) Principal	1.72	1.72	1.72	1.72	1.72
2. General Services	1.78	1.78	1.78	1.78	1.78
B. Operation and Maintenance of Plant	4.21	4.21	4.21	4.21	4.21
1. Operation of Buildings and Grounds	2.53	2.53	2.53	2.53	2.53
2. Upkeep of Buildings, Grounds, and General Equipment	1.68	1.68	1.68	1.68	1.68
C. Instruction	18.69	21.91	20.99	21.66	21.33
1. Teachers' Salaries	18.48	21.54	20.37	21.22	20.91
2. Instructional Supplies and Equipment Upkeep	.21	.37	.62	.44	.42
D. Grand Total	$31.67	$34.89	$33.97	$34.64	$34.31

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[1] This table is based on Schedules H-1, H-2, and H-2-c of the Appendix. See also explanatory note, page 45.

likewise a thoroughgoing Gary school, but has never had its full complement of pupils. An increased enrollment would undoubtedly require corresponding additions to the teaching force, but would probably not cause a corresponding increase in plant operation expenditure. On the other hand, Jefferson, while crowded, is an old-fashioned building, slightly remodeled, and offers, in comparison with Emerson and Froebel, limited advantages.

Accordingly, the cost at Jefferson, based on average daily attendance, runs very uniformly for the different grades—$31.67 for the kindergarten, $34.89 for grades 1 to 5, and $33.97 for grades 6 to 8. It varies, in contrast, at Froebel from $40.17 for the kindergarten to $48.51 for grades 1 to 5, $57.54 for grades 6 to 8, with an average of $79.22 for the different years of the high school. The differences at Emerson are even greater and the cost still higher: for the kindergarten, $46.83; grades 1 to 5, $64.49; grades 6 to 8, $74.58; and $90.80 for the high school. In comparing cost at Emerson and Froebel with cost at Jefferson, and particularly in comparing grade cost at Emerson and Froebel with the cost of elementary instruction in other cities, it should be borne in mind that elementary pupils in Emerson and Froebel enjoy unusual opportunities in shops and in science, and that high school teachers instruct them both in science and in drawing.

V. CURRENT COST OF THE SCHOOL SHOPS

A FINANCIAL report of the Gary schools might well cover in detail each of the activities Gary emphasizes. For practical reasons we confine ourselves to a single special feature, the school shops.

We include under shops not only forge, foundry, etc., but the manual training shops. The manual training shops are included because they also do productive work and the credits they receive for their products reduce the cost of operating them by 12 to 31 per cent.

The Gary authorities distinguish between regular day and Saturday shops, dividing the operating expense five-sixths to the day school and one-sixth to the Saturday school. In our discussion, we disregard this distinction and combine the cost, for there is only one set of shops and, as pointed out above, the expense would be practically the same whether they are open five or six days a week.

Owing to the peculiar method of handling shop cost, it is especially important at the outset to fix in mind the initial or total amount spent on shops. This aggregated in 1915-1916, exclusive of supervision, $22,535.31, and was distributed as shown in Table XIX.

This expenditure covers the wages of the manual

Forge—Emerson School

TABLE XIX

TOTAL SHOP COSTS

REGULAR DAY AND SATURDAY SCHOOLS COMBINED

SHOPS	CURRENT EXPENSES						
	TOTAL	OTHER THAN UPKEEP AND DEPRECIATION				UPKEEP OF SHOPS AND EQUIPMENT	DEPRECIATION OF EQUIPMENT
		Salaries and Wages of Instructors and Assistants	Instructional Supplies (Materials)	Other Supplies and Expenses	Total		
Total	$22,535.31	$17,826.11	$3,650.32	$375.37	$21,851.80	$683.51	
Manual Training Shops							
Froebel School	1,972.05	1,856.65	104.11		1,960.76	11.29	
Jefferson School	1,899.29	1,733.51	117.05	31.25	1,881.81	17.48	
Beveridge School	568.88	498.07	46.64	16.92	561.63	7.25	
Glen Park School	766.17	640.00	77.06	18.36	735.42	30.75	
Cabinet Shop, Froebel School	1,712.65	1,340.16	335.19		1,675.35	37.30	
Pattern Shop, Emerson School	1,006.02	676.65	199.83	3.37	879.85	126.17	
Foundry, Emerson School	1,681.41	1,244.95	137.54	93.72	1,476.21	205.20	
Forge, Emerson School	1,831.30	1,445.89	232.10	92.31	1,770.30	61.00	
Machine Shop, Emerson School	1,208.93	937.00	176.72	46.72	1,160.44	48.49	
Plumbing Shop, Froebel School*	1,990.59	1,758.00	220.69	3.90	1,982.59	8.00	
Sheet Metal Shop, Froebel School*	1,586.41	1,267.63	243.32	9.37	1,520.32	66.09	
Paint Shop, Froebel School	1,761.80	1,101.94	640.49	9.50	1,751.93	9.87	
Print Shop, Emerson School	2,147.04	1,311.58	798.27	10.59	2,120.44	26.60	
Print Shop, Froebel School	1,406.11	1,027.08	311.65	39.36	1,378.09	28.02	
Shoe Shop, Froebel School	662.00	662.00			662.00		
Pottery, Froebel School	334.66	325.00	9.66		334.66		

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* Including the short period these shops were located at Emerson School.

training teachers and of the shopmen, the outlay for all materials used in instruction and in productive work, as well as for supplies, upkeep of shops, and shop equipment.

While Gary actually spent during 1915-1916 $22,535.31 on regular day and Saturday shops, the final or net cost to be charged against instruction was much less. The shops, as stated before, do productive work for which they receive credit.[1] The credits, as computed by us, amounted in 1915-1916 to a total of $12,217.62. (Table XX.) The soundness of thus reducing instruction cost must now be discussed.

The Gary authorities credit the shops to the extent of the estimated market value of their products; but, for reasons that will appear as we proceed, we credit them only with production cost. To illustrate: If lumber, hardware, etc., including operation supplies, to the amount of $15, and labor to the amount of $35 go into the construction of a school desk, the production cost of the desk is $50, and we credit the shop with $50, regardless of whether the market value of the desk is $25, $75, or what not. However, the credits thus allowed include not only the productive work of the regular day and Saturday schools, but also such products as the night schools turn out.[2]

In order to compute on the basis of production cost the

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[1] The shoe shop and the pottery are the only shops that receive no such credit.

[2] The amount of productive work done in the night schools is small and so interwoven with the productive work of the regular day and Saturday schools that it was impossible to separate it and erect a separate account.

TABLE XX

SHOP PRODUCTION CREDITS

Regular Day and Saturday Schools Combined

Credits			Shops	Amount Credited to:				Estimated* Market Value of Shop Products
Labor	Materials	Total		Total	Operation	Upkeep of Property and Equipment	Capital Outlay	
$9,572.77	$2,644.85	$12,217.62	Total	$12,217.62	$2,473.15	$ 5,965.38	$3,779.09	$16,268.87
			Manual Training Shops:					
173.88	53.62	227.50	Froebel School	227.50		199.45	28.05	
303.29	24.60	327.89	Jefferson School	327.89		313.91	13.98	
164.48	14.00	178.48	Beveridge School	178.48		127.53	50.95	
98.26	28.27	126.53	Glen Park School	126.53		119.80	6.73	
1,200.04	274.21	1,474.25	Cabinet Shop, Froebel School	1,474.25	6.21	403.08	1,064.96	1,908.60
549.57	169.89	719.46	Pattern Shop, Emerson School	719.46	10.12	479.10	230.24	1,039.05
492.72	110.15	602.87	Foundry, Emerson School	602.87		300.35	302.52	1,008.79
988.79	114.40	1,103.19	Forge, Emerson School	1,103.19	5.75	699.38	398.06	1,360.48
420.85	53.04	473.89	Machine Shop, Emerson School	473.89	40.24	256.72	176.93	641.73
1,627.00	113.22	1,740.22	Plumbing Shop, Froebel School	1,740.22	6.00	1,008.94	725.28	4,170.80
1,130.55	172.25	1,302.80	Sheet Metal Shop, Froebel School	1,302.80	20.92	798.77	483.11	1,457.71
1,037.20	544.13	1,581.33	Paint Shop, Froebel School	1,581.33	24.70	1,258.35	298.28	
752.24	765.51	1,517.75	Print Shop, Emerson School	1,517.75	1,517.75			3,167.01
633.90	207.56	841.46	Print Shop, Froebel School	841.46	841.46			1,514.70

* Estimates of shop instructors, covering the production of all schools, day, night, Saturday, and summer. The omission of this statement as to Manual Training and Paint Shops is due to a confusion in their records.

credits to be granted the several shops, it became necessary for us to determine as exactly as possible two factors: (a) the time, and (b) the materials, distributed against production. Each of these factors calls for consideration.

In a well-managed industrial concern, it is a simple matter to decide on the labor cost of production, but in the Gary school shops it was extremely difficult. In the first place, there are in the school shops, as a rule, two kinds of workers—the pupils and the instructors. The pupils may be busy on something for themselves, but more often they are working—especially the older ones—on building and equipment repairs, on additions to buildings, on new equipment, or on supplies. These older pupils fill out time slips in a formal manner, but their time, except when pupils are paid as helpers, is rarely distributed against construction work. In a word, their time is not considered and does not enter directly as a factor in reporting production cost.

In the second place, the teacher may be busy with instruction and shop routine; he may be engaged along with his pupils on constructive work; he may be engaged on a job independently, meanwhile supervising also the work of pupils; or he may be absent from the shop altogether, on a special assignment, such as repairing a roof, power plant, or the like. In whatever capacity he is engaged—and the records are not always clear—it is the time of the instructor only, not the time of pupils, except when they are paid as helpers, that is taken into account.

The artisan-instructor first reports his time on a time slip,[1] which covers his entire period of duty. The time thus reported is distributed between non-productive and productive hours. But the productive hours as here given do not have the same meaning as productive time entered on similar slips in industry. In industry, productive time on time-slip reports indicates the actual time that the workman himself gave to the job. Productive time as recorded on the Gary time slips may mean one of several things—it is impossible to tell which. It may mean (a) the hours the instructor himself worked on the job; or (b) the instructor's estimate of the time he gave to supervision, instruction, and assistance while his pupils worked; or (c) the instructor's estimate of how long it would have taken him to do the task himself, regardless of the attention he gave to supervision and instruction while his pupils were doing the work, and regardless of the time they actually gave to it. Obviously, when the record of productive time on the time slips is thus ambiguous, it is impossible to determine the amount of time the artisan-teachers themselves give to production. Therefore, if productive time at Gary as reported on time slips is construed as equivalent to productive time in industry, such an interpretation involves the assumption that the time of the instructor devoted to supervision and instruction of children is offset by their labor.

While the Gary authorities require their artisan-instructors to make the time report in question, they compute the labor cost of production on the basis of a second report in which productive hours of service are entered against specific jobs. But even the productive time of this second report[1] does not have the same meaning as productive time in industry. It may and does include such items as "instruction," that is, attendance on teachers' conferences and the like. Moreover, the time so reported may be and often is an estimate made at the completion of the job, not a record, made step by step, as the work progresses. Hence, even the produc-

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[1] Manual training teachers do not make this time slip report.

TABLE XXI

PRODUCTIVE TIME FROM TIME SLIPS AND PRODUCTIVE TIME FROM PRODUCTION REPORTS

Regular Day and Saturday Schools Combined

SHOPS	PRODUCTIVE TIME FROM TIME SLIPS†	PRODUCTIVE TIME FROM PRODUCTION REPORTS*	DIFFERENCE
Cabinet Shop	$ 1,327.95	$1,200.04	$ 127.91
Pattern Shop	588.59	549.57	39.02
Foundry.....	867.92	492.72	375.20
Forge........	1,365.00	988.79	376.21
Machine Shop	744.25	420.85	323.40
Plumbing Shop	1,661.69	1,627.00	34.69
Sheet Metal Shop.......	1,225.55	1,130.55	95.00
Paint Shop...	1,093.94	1,037.20	56.74
Print Shop, Emerson...	920.04	752.24	167.80
Print Shop, Froebel....	648.73	633.90	14.83
Total.....	$10,443.66	$8,832.86	$1,610.80

† This tabulation does not include the non-productive time reported on time slips.

* In this calculation the $739.91 of productive time credited to manual training teachers is not included because they are paid on a monthly basis and do not make time-slip reports.

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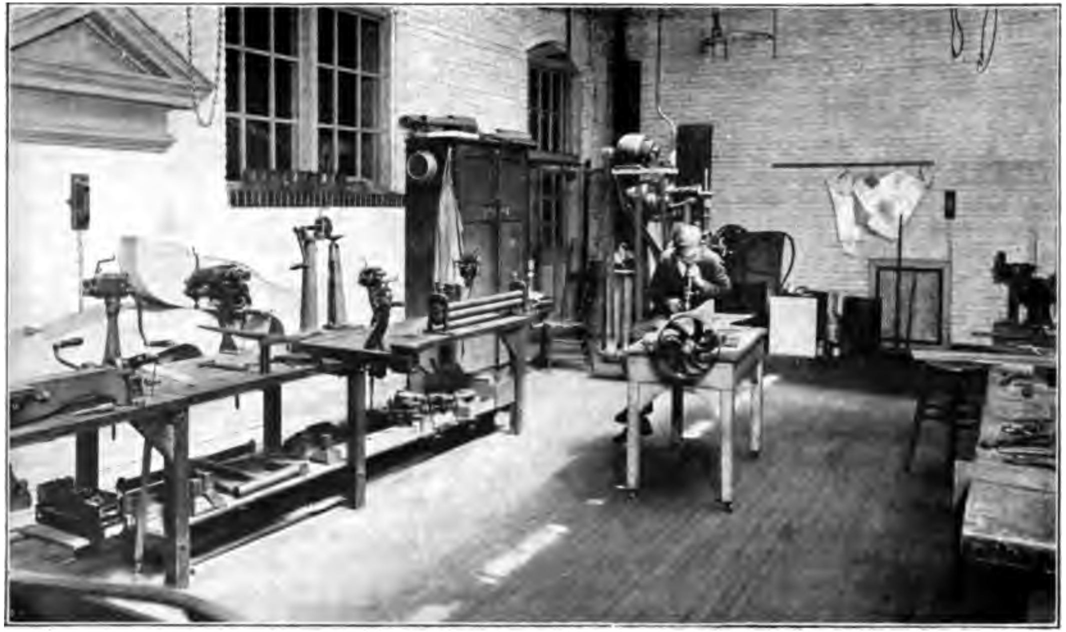
[1] This report is made also by manual training teachers.



Sheet Metal Shop—Froebel School

tive time recorded on the second report may have any one or all of the meanings mentioned in connection with the productive time reported on the previous time slips.

These two separate reports on productive time are not checked one with the other, and hence do not agree. When expressed in terms of money, there is a difference between them of $1,610.80 (Table XXI)—a difference which it was impossible for us to reconcile.

Therefore, in attempting to determine the labor cost of production we were compelled to take the reports of productive time at their face value, treating the productive time so reported—which in most cases is an estimate of unknown meaning—just as if it had the same definiteness and significance as productive time in industry. We were also compelled, inasmuch as we had no definite basis which would enable us to augment the time of the instructor in respect to particular jobs, to base our credit allowances on the productive time given in the second time report, which is less, as pointed out, by $1,610 than that given in the first or time-slip report. In consequence, the sum in question, representing the difference between the productive time of the two reports, became a charge against instruction.

Similar difficulties were encountered in attempting to determine the cost of materials. Theoretically, all materials and supplies are first assembled in a storeroom and afterwards distributed to the shops on requisition. In practice, while some materials go through the storeroom, much goes directly to the shops; and in the case of special construction or repair jobs material may even be delivered directly to the building where the work is to be done. For example, paper and printing ink are stored on open shelves in the print shops; pig-iron, coke, and foundry supplies, in bins in the foundry; bar-iron and steel, on open racks in the forge shop; pipes and plumbing supplies, in the plumbing shop. When needed, these are used by the instructor of the shop in which they are stored, and by the instructors of other shops as well.

Under these circumstances, there is no little opportunity for error. An instructor who has used material may forget to make out a requisition; again, in estimating the value of the material there may be inaccuracies in respect to quality, quantity, price, and extensions; with the result that correct charges may not be made or materials may be charged against the wrong job. In a word, the control over materials and supplies is not rigorous. This is evidenced by the reported deficits in the storeroom—$9,486 in 1913-1914,[1] and $5,240 in 1914-1915[2]. Nor is the total value of the materials received checked against the value of the materials used and on hand. Thus, without proper inventories, invoices, and requisitions, it was impossible for us to do more than accept the values of the materials consumed in construction as reported by the shop instructors.

The production credits as computed by us and given in Table XX are based, therefore, on productive time and purchase value of materials as entered by the shop instructors in their production reports. While these were generally accepted, no effort was spared to examine payrolls, invoices, requisitions, or whatever might throw light on the question at issue. While it is frankly admitted that there may be errors in some of the details of these analyses, it is believed that they are as accurate as it is possible to make them from existing data.

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[1] Financial Report of the Gary Public Schools, 1913-1914.

[2] Financial Report of the Gary Public Schools, 1914-1915.

In determining the character of the credit—that is, whether it should be charged to operation, upkeep, or capital outlay—the Gary distribution was followed; the only departures arise from an occasional difference of judgment as to classification of items.

With credits allowed and their distribution determined, it is a short road to the final cost of the Gary school shops. Their final or net cost represents the difference between the total initial expenditure, $22,535.31, and the production credits allowed, $12,217.62, a difference of $10,317.69. Taken as a whole, the Gary school shops thus appear, without counting educational supervision, to be 54 per cent. self-supporting; that is, there is an abatement, by reason of productive work, of 54 per cent. of the total initial cost.

The final cost of the respective shops, when credit is given for only the labor and material value of these products, is as given in Table XXII.

However, if credit is given on the basis of the estimated market value of their products, as fixed by the instructors, the final cost of the shops would be quite different. The

TABLE XXII[1]

FINAL SHOP COSTS

REGULAR DAY AND SATURDAY SCHOOLS COMBINED

SHOPS	CURRENT EXPENSES						
	TOTAL	OTHER THAN UPKEEP AND DEPRECIATION				UPKEEP OF SHOPS AND EQUIPMENT	DEPRECIATION OF EQUIPMENT
		Salaries and Wages of Instructors and Assistants	Instructional Supplies (Materials)	Other Supplies and Expenses	Total		
Total	$10,317.69	$8,253.34	$1,005.47	$375.37	$9,634.18	$683.51	
Manual Training Shops:							
Froebel School	1,744.55	1,682.77	50.49		1,733.26	11.29	
Jefferson School	1,571.40	1,430.22	92.45	31.25	1,553.92	17.48	
Beveridge School	390.40	333.59	32.64	16.92	383.15	7.25	
Glen Park School	639.64	541.74	48.79	18.36	608.89	30.75	
Cabinet Shop, Froebel School	238.40	140.12	60.98		201.10	37.30	
Pattern Shop, Emerson School	286.56	127.08	29.94	3.37	160.39	126.17	
Foundry, Emerson School	1,078.54	752.23	27.39	93.72	873.34	205.20	
Forge, Emerson School	728.11	457.10	117.70	92.31	667.11	61.00	
Machine Shop, Emerson School	735.04	516.15	123.68	46.72	686.55	48.49	
Plumbing Shop, Froebel School[2]	250.37	131.00	107.47	3.90	242.37	8.00	
Sheet Metal Shop, Froebel School[2]	283.61	137.08	71.07	9.37	217.52	66.09	
Paint Shop, Froebel School	180.47	64.74	96.36	9.50	170.60	9.87	
Print Shop, Emerson School	629.29	559.34	32.76	10.59	602.69	26.60	
Print Shop, Froebel School	564.65	393.18	104.09	39.36	536.63	28.02	
Shoe Shop, Froebel School	662.00	662.00			662.00		
Pottery, Froebel School	334.66	325.00	9.66		334.66		

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[1] This table is based on Schedules H-2 and H-3 of the Appendix.

[2] Including the short period these shops were located at Emerson School.

shop instructors, in 1915-1916, placed a market value on their products of $16,268, which is alone 72 per cent. of the initial cost of all shops; but it should be noted that this amount (Table XX) does not include the market value of the products of the manual training shops or of the paint shop, as the records of these shops were incomplete.

The market value estimates furnished by the instructors are in many cases higher than the labor and material cost of the products; the difference represents the supposed work of the pupils over and above the productive time lost by the instructor in teaching and supervising them, or the supposed profit of a vendor, or both.

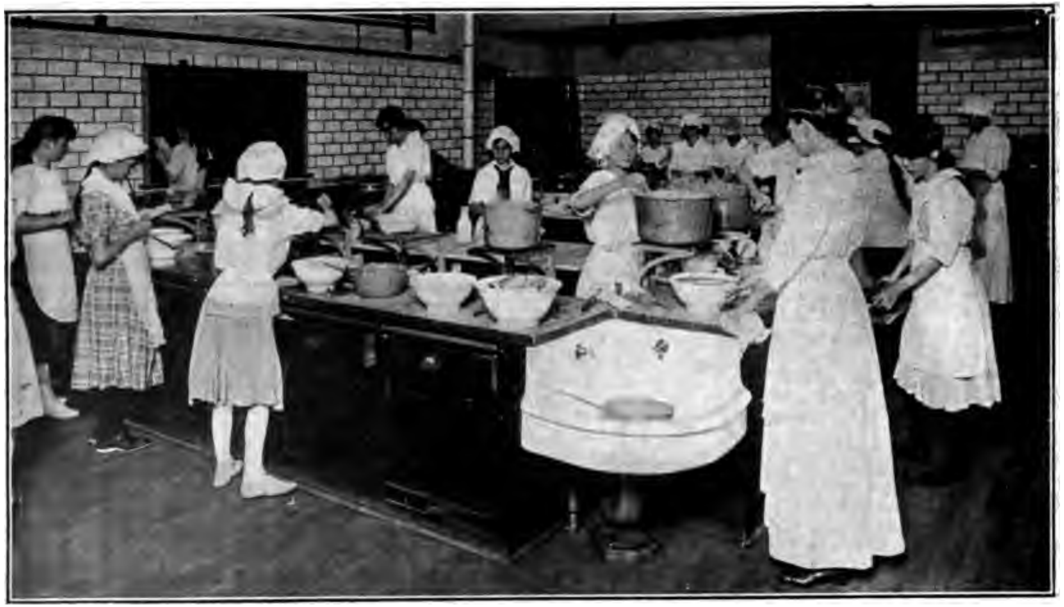
Owing to the diversity of the products and the uncertainty with regard to the productive time and the materials charged against particular jobs, it was impossible to check these estimates from the reports themselves or from outside sources. But the question may fairly be raised as to whether Gary is not paying high for all its productive work, even when this is charged to the system at actual labor and material cost. Without doubt the market value estimates made by the instructors would in trade often be regarded as high. (Table XXIII.)

Finally, crediting the shops for what they do at the actual labor and material cost of production amounts simply to charging other departments and divisions of the system for an expenditure actually made. But adding to the original expense an imaginary profit of 25 to 150 per cent. is equivalent to charging other departments and divisions of the system with an expense

TABLE XXIII

ESTIMATED MARKET VALUE OF ILLUSTRATIVE ITEMS

SHOP	ITEM	LABOR	MATERIALS	TOTAL COST	ESTIMATED MARKET VALUE
Cabinet Shop	Hanging of fire extinguisher	$10.40		$10.40	$15.00
Pattern Shop	Repair of stair rail	10.40	$ .50	10.90	16.50
Foundry	Repairs to cleaning bench	4.50	1.50	6.00	8.00
Forge	Repairs to playground equipment	25.00	1.00	26.00	35.00
Machine Shop	Assisting in foundry	15.00		15.00	22.50
Machine Shop	Drillings	12.50	.30	12.80	17.50
Plumbing Shop	Repair of aquarium	45.00	16.24	61.24	85.73
Sheet Metal Shop	Steel ceiling	40.00	22.69	62.69	62.69
Print Shop, Froebel	"Round Table" (school paper)	8.33	8.00	16.33	40.00
Manual Training Shop	Care of building and teaching	20.85		20.85	35.00



Cooking Room—Emerson School

that was never incurred, and makes the reported expenditure larger than the real expenditure. On the other hand, crediting the shops to the extent of this imaginary profit reduces their operation cost far below what the cost actually is. In a word, administrative policies and school accounting run into all kinds of inconsistencies when based on anything besides actual expenditures. Hence, we believe that we are justified in basing credits on actual labor and material cost, and reporting the Gary school shops as 54 per cent. self-supporting.

It should, however, be remembered that this estimate is derived by taking all shops together, including even the shoe shop and the pottery, though they do no productive work for which they receive credit. On the other hand, while the manual training shops do receive credit for their products, they are not operated primarily on a production basis, as are the following shops:

[1]Cabinet shop	(Froebel)
Pattern shop	(Emerson)
Foundry	(Emerson)
Forge	(Emerson)
Machine shop	(Emerson)
Plumbing shop	(Froebel)
Sheet metal shop	(Froebel)
Paint shop	(Froebel)
Print shop	(Emerson)
Print shop	(Froebel)

If, therefore, these essentially productive shops are considered by themselves, and credited on the basis of the labor and material cost of their products, they are 69 per cent. self-supporting; that is, there is an abatement, by reason of productive work, of 69 per cent. of their total initial cost. (Tables XIX and XXII.)

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[1] After April, 1916, the cabinet shop was operated as a manual training shop.

VI. CAPITAL OUTLAY FOR GROUNDS, BUILDINGS, AND EQUIPMENT

WE HAVE been engaged up to this point in seeing what it cost to operate the Gary schools in a given year. The Gary plan requires more extensive school grounds, a new type of school building, and more abundant equipment than the old-type education. Now, what capital outlay has been involved in thus instituting these schools?

Gary's capital investment in grounds, buildings, and equipment at the end of the school year 1915-1916 aggregated $1,016,319 (Table XXIV), equal to a capital outlay of $246[1] per pupil in average daily attendance. But this city-wide average, although suggestive, sheds little light on the per capita outlay which a thoroughgoing Gary system would require; for the widest disparity exists in building facilities, as is clearly revealed in the differences in per pupil plant investment, ranging, as it does, from $38 in the poorest schools to $524 at Emerson.

Nor does the per capita investment of $135 at Jeffer-

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[1] We are aware that per pupil capital outlay should be expressed in terms of pupil building capacity. But, as will be pointed out, the demonstrated pupil capacity of at least the larger Gary buildings is not known, and for this reason we fall back on average daily attendance.

TABLE XXIV[1]

CAPITAL OUTLAY FOR SCHOOL GROUNDS, BUILDINGS, AND EQUIPMENT

PLANT	GROUNDS AND IMPROVEMENTS	BUILDINGS	EQUIPMENT	TOTAL	PER PUPIL IN AVERAGE DAILY ATTENDANCE
Administrative Offices....		$ 1,000.00	$ 2,440.73	$ 3,440.73	$ .83
Emerson..............	$ 66,098.45	260,908.83	61,878.79	388,886.07	524.11
Froebel................	77,571.75	316,283.23	39,662.57	433,517.55	288.43
Jefferson..............	18,205.24	77,490.59	2,614.16	98,309.99	135.04
Beveridge.............	5,988.01	13,367.87	3,259.02	22,614.90	43.49
Tolleston..............	13,294.05			13,294.05	
Glen Park.............	8,952.56	19,156.03	2,487.05	30,595.64	136.59
All Other Schools........	2,246.11	10,526.78	2,887.99	15,660.88	37.74
Farm..................	10,000.00			10,000.00	
Total................	$202,356.17	$698,733.33	$115,230.31	$1,016,319.81	$245.96

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[1] These figures are from the Report of the Public Schools of Gary, to which, after minor corrections, was added the capital outlay for 1915-1916. See Schedule H-7 of the Appendix. It is well to note that all this property has been acquired since 1906 and that Beveridge and Glen Park are old settlements annexed to Gary in 1912, each having a small plant of its own.

son, or $288 at Froebel, or of $524 at Emerson supply a reliable basis for judgment as to what the necessary outlay would be. As pointed out above, Jefferson is an old-style, remodeled building, affording simply conventional facilities. Emerson and Froebel meet the requirements of a Gary school, but, as stated before, neither of these buildings has ever been used to capacity on the Gary plan. Consequently, on the basis of present use, the per capita investment as shown for Jefferson is probably lower, and that for Emerson and Froebel is considerably higher, especially that for Emerson, than would be required by a thoroughgoing Gary system.

In the absence of positive data on the capital outlay required by a Gary school, we must at present content ourselves with an estimate. Obviously, the estimate will vary with the amount and price of land provided for outside activities, as also with the type and character of the proposed building. Even a more important factor is the pupil capacity of the plant on the Gary plan. This will vary according to the proposed length of the school day, the proposed size of classes in the old-line studies, the time division between the "fundamentals" and the "special branches," the amount and extent of departmentalization, the number of children placed at one time in auditorium, music rooms, laboratories, shops, and the like, and according to the indoor provisions for the accommodation of children in bad weather, when outside facilities cannot be used.

With these different factors affecting the estimate,

TABLE XXV

Capital Outlay on Estimated Capacity[1]

SCHOOL	GROUNDS		BUILDINGS		EQUIPMENT		GROUNDS, BUILDINGS AND EQUIPMENT	
	Capital Outlay	Per Pupil Outlay	Capital Outlay	Per Pupil Outlay	Capital Outlay	Per Pupil Outlay	Capital Outlay	Per Pupil Outlay
Emerson......	$66,098.45	$28.74	$260,908.83	$113.44	$61,878.79	$26.90	$388,886.07	$169.08
Froebel.......	77,571.75	33.73	316,283.23	137.51	39,662.57	17.25	433,517.55	188.49

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[1] Emerson and Froebel, according to the Superintendent, each have accommodations for 6 kindergarten classes of 50 pupils, 34 first to sixth grade classes of 40 pupils, 8 seventh and eighth grade classes of 35 pupils, and 12 high school classes of 30 pupils, a total of 60 classes, accommodating 2,300. For a detailed description of these buildings, see report on Organization and Administration.

there is no likelihood at present of agreement on the pupil capacity of a building operated on the Gary plan, and positive knowledge must await experimentation and experience with a definite program.

In the meantime, an idea of the required per pupil capital outlay may be obtained from an estimate based on the present capital investment in the two largest Gary plants, and on the superintendent's judgment of their respective capacities. On this basis, assuming that the present equipment is adequate for the maximum estimated enrollment, the per pupil capital outlay at Emerson would be $169, and at Froebel, $188. (Table XXV.) Of course Emerson and Froebel could not be duplicated to-day at anything like their original cost, and, as stated before, the pupil capacity will differ with the requirements of the program followed.[1]

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[1] For an analysis of the superintendent's estimate, see report on Organization and Administration.

VII. FIXED CHARGES

IN ADDITION to the current expense of operating a school system and to the capital invested in grounds, buildings, and equipment, there is a type of school expenditure which we have not included as part of current cost, nor as part of capital outlay, though it is unquestionably part of the current school burden upon the community. All such expenditures are grouped under Fixed Charges and ordinarily embrace rent, insurance, pensions, taxes for local improvements, and interest on funded and floating debt.

Gary does not maintain a local teachers' pension fund, and rentals for school purposes have been negligible, amounting in 1915-1916 to only $30 for a storage coal yard. The usual building, security and liability insurance is carried, the premiums for 1915-1916 being $619.59. But the interest charges appear always to have been heavy. In 1915-1916 alone, they amounted to $33,248.85, equal to 8.6 per cent. of the total revenues for the year. (Table XXVI, and Schedule H-1 of the Appendix.)

It is not difficult to understand this fact. The Gary authorities had the task of creating an entire school system in a brief period. Bonds have been issued for

TABLE XXVI

INTEREST BURDEN, 1906-1916

YEAR	INTEREST ON BONDS	INTEREST ON FLOATING DEBT	TOTAL INTEREST	PER CENT. OF TOTAL REVENUES[1]
1906–7		$ 116.32	$ 116.32	0.7
1907–8		67.08	67.08	0.2
1908–9	1,093.55	1,045.78	2,139.33	2.2
1909–10	9,236.20	709.03	9,945.23	7.7
1910–11	10,431.47	333.96	10,765.43	5.6
1911–12	14,195.60	4,402.99	18,598.59	8.3
1912–13	13,842.50	6,551.87	20,394.37	8.1
1913–14	20,153.60	10,932.27	31,085.87	10.2
1914–15	19,505.95	15,601.60	35,107.55	10.8
1915–16	22,756.50	10,492.35	33,248.85	8.6
Total	$111,215.37	$50,253.25	$161,468.62	8.2

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[1] Exclusive of loan funds (bonds and short-term loans).

buildings, but the half million[1] secured in this way was not adequate to erect enough buildings of the proposed type to keep pace with the school population.

To carry out the proposed building program, large sums, as we shall see in the next section, have been taken from current taxes for permanent improvements. Indeed, this has been done to such an extent that the funds for ordinary current expenses have been continuously depleted, with the result that it has been necessary, in order to keep the schools going, either to raise large amounts on temporary loans, or to defer the payment of school warrants. For example, at one time in 1914 there were outstanding unpaid warrants to the amount of $100,000. Whether the money was obtained on short-term notes, or whether the payment of school warrants was deferred, interest had to be paid. The heavy interest burden of the Gary schools is thus due to the size of the floating debt as well as to the bond issues.

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[1] See Table XXVII and Table G of the Appendix.

VIII. FINANCING THE SYSTEM

GARY'S total school expenditure up to the end of 1915-1916 amounted to two and a half million dollars. It remains to inquire how this sum was raised.

As elsewhere, school funds are derived chiefly from three sources, viz., the state apportionment,[1] local taxation, and bond issues. Between 1906 and 1916 the state paid over to the Gary board of education $356,016.63; direct local taxation provided $1,614,284.74; and bonds account for $509,728.07. (Table XXVII.) Hence, for the period, 14.4 per cent. of the board's entire income came from the state, 65.1 per cent. from direct local taxation, and 20.5 per cent. from bonds. Sixty-five per cent. is not only a good proportion to raise locally, but the actual amounts produced—$15,725.97 in the first year of her corporate existence and $323,786.70 in 1915-1916—are large.

Gary has been able to raise large amounts for public education, in the first place because she has always commanded relatively large resources. Millions were invested in the industrial plants giving birth to the city,

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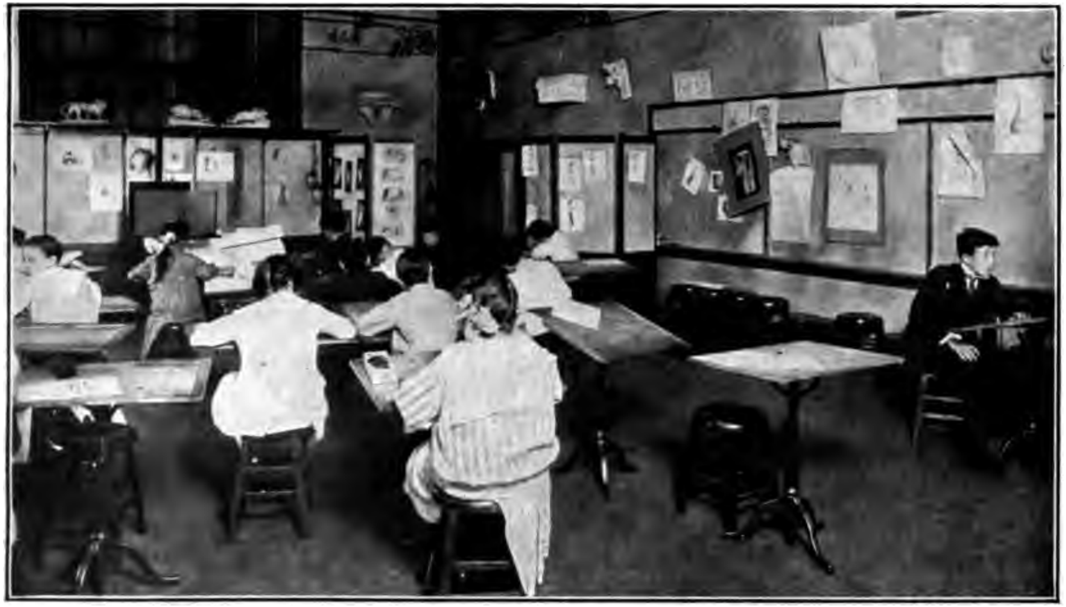
[1] The state holds in trust certain vested funds and levies a state-wide school tax; the income from the former and the proceeds from the latter are apportioned annually to the separate school districts.



Art Studio—Emerson School

TABLE XXVII

SOURCE AND AMOUNT OF SCHOOL FUNDS[1]

YEAR	TOTAL AMOUNT RAISED	AMOUNT RECEIVED FROM STATE LEVY AND OTHER STATE FUNDS	PER CENT. RECEIVED FROM STATE	AMOUNT RAISED BY DIRECT LOCAL TAXATION	PER CENT. RAISED BY DIRECT LOCAL TAXATION	AMOUNT RAISED BY BOND ISSUES	PER CENT. RAISED BY BOND ISSUES
1906-7...	$ 17,139.89	$ 1,413.92	8.2	$ 15,725.97	91.8		
1907-8...	42,380.94	6,873.66	16.2	35,507.28	83.8		
1908-9...	235,900.81	10,644.56	4.5	85,868.34	36.4	$139,387.91	59.1
1909-10..	179,103.59	16,758.40	9.3	112,084.19	62.6	50,261.00	28.1
1910-11..	253,326.06	38,358.14	15.1	154,792.59	61.1	60,175.33	23.8
1911-12..	348,774.81	45,143.15	13.0	178,003.54	51.0	125,628.12	36.0
1912-13..	252,258.14	52,910.09	21.0	199,348.05	79.0		
1913-14..	364,501.50	60,537.29	16.6	243,964.21	66.9	60,000.00	16.5
1914-15..	349,365.40	60,896.38	17.4	265,203.87	75.9	23,265.15	6.7
1915-16..	437,278.30	62,481.04	14.3	323,786.70[2]	74.0	51,010.56	11.7
Total..	$2,480,029.44	$356,016.63	14.4	$1,614,284.74	65.1	$509,728.07	20.5

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[1] Exclusive of short-term notes, a total of $38,800; of $51,185.22, overdraft as of July 31, 1916; and of $12,804.60 bond indebtedness assumed with annexed territory.

[2] This amount includes $6,182.18 derived from miscellaneous sources.

before there were any schools. When the schools were organized, this wealth lay at hand ready to be taxed for their support. Meanwhile, the wealth of the city has increased rapidly, additional millions going into industry and still further millions into the upbuilding of the city itself, with the result that Gary has probably had from the beginning greater resources back of each child to educate than the majority of cities of similar size and character.[1] For example, in the school year 1908-1909, the taxable property back of each child in average daily attendance amounted to $7,984. Attendance has increased more rapidly than taxable wealth, but even so there was in 1915-1916 $5,387 of taxables for each child in daily attendance. (Table XXVIII.) Among Gary's nearest neighbors approaching comparable size, Hammond had, in 1914-1915, $3,053 for each child in attendance, and East Chicago, $3,033.

In the second place, Gary has contributed freely in support of public education, the local tax levy often reaching well up toward the limit permitted by law. (Table XXIX.) The very first year of the system, 1906, saw the lowest levy, 80 cents on each $100, whereas for the last three years the rate has remained uniformly

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[1] When the assessed property values for 1913 in seventy-four cities with a population of 30,000 and less than 50,000 reported in Financial Statistics for Cities, 1913, are placed against the average daily attendance for 1914-1915 as given in the Report of the U. S. Commissioner of Education for 1915-1916, the median wealth back of each child is $4,901, as compared with $5,252 at Gary. Undoubtedly, the greatest differences prevail in methods of assessment and in reporting attendance. These are, however, the best and only data available to show Gary's relative financial strength.

TABLE XXVIII

Assessed Property Value[1] Back of Each Child

ASSESSED PROPERTY VALUE		SCHOOL POPULATION			AVERAGE DAILY ATTENDANCE		
Year	Assessed Value	Year	Children 6 to 20 Years of Age	Wealth per Child	Year	Number in Attendance	Wealth per Pupil
1906	$ 2,904,905	1907			1907-8	273	$10,641
1907	5,700,905	1908	1,480	$3,852	1908-9	714	7,984
1908	6,949,810	1909	1,668	4,166	1909-10	957	7,262
1909	9,631,465	1910	2,534	3,801	1910-11	1,936	4,975
1910	13,337,665	1911	4,013	3,324	1911-12	2,222	6,003
1911	18,942,655	1912	5,079	3,730	1912-13	3,115	6,081
1912	20,058,390	1913	6,114	3,281	1913-14	3,563	5,630
1913	21,463,255	1914	7,457	2,878	1914-15	4,087	5,252
1914	22,259,295	1915	7,041	3,161	1915-16	4,132	5,387
1915	28,211,440	1916	8,054	3,503			
1916	28,308,850						

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[1] The common impression is that Gary property is assessed at about one-sixth its cash value. Also, it is important to note that the assessed property value, for example, of 1907 is set against the enumeration of 1908 and the school attendance of 1908-9. This is for the reason that in Indiana the assessed property value is fixed each year prior to May 15th, but the taxes collected on this assessment, for example 1907, are not available for school purposes before August 1, 1908, and are for the support of the schools during the school year 1908-9.

at $1.25.[1] The present levy for current operation, which includes the supplementary tuition tax and special taxes, is alone $1.15. There are two points in this connection worthy of comment. The supplementary tuition tax, which must be used for teachers' salaries, is kept uniformly below the maximum, whereas special taxes, more or less flexible in that they are at times used for purposes other than those for which they are levied, approximate the maximum.

Gary has also bonded herself to the legal limit—2 per cent. of all taxable property. Besides issuing bonds aggregating $506,500, Gary inherited through annexation a bond debt of $12,804.60, all but $1,000 of which has been extinguished, leaving bonds outstanding on July 31, 1916, of $507,500. (Table G of the Appendix.)

In addition to these bonds, there were other liabilities on July 31, 1916, amounting to $122,030.43, or total liabilities of $629,530.43. As an offset there were, besides the $1,016,319.81 in grounds, buildings, and equipment, other assets aggregating $21,181.50, or total assets of $1,037,501.31. Hence, the difference between the total assets and the total liabilities, $407,970.88, represents the Gary equity in school property. (Table B of Appendix.)

The financial history of the Gary schools to date may therefore be summarized as follows: The state has con-

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[1] A high tax rate usually accompanies a low assessed property value and vice versa; property at Gary, as previously stated, is assessed at about one-sixth of its cash value.

TABLE XXIX

LOCAL LEVIES 1906-1915 ON EACH $100 OF TAXABLE WEALTH

YEAR OF LEVY	SUPPLEMENTARY TUITION TAX		SPECIAL TAXES										BOND PRINCIPAL AND INTEREST TAX		TOTAL LEVY	MAXIMUM PERMITTED
			Special School Tax		Vocational School Tax		Kindergarten Tax		Additional Special School Tax		Compulsory Education					
	Levy	Maximum Permitted	Levy	Maximum Permitted	Levy	Maximum Permitted	Levy	Maximum Permitted	Levy	Maximum Permitted	Levy	Maximum Permitted	Levy	Maximum Permitted		
1906	30c	50c	50c	50c										25c	$ .80	$1.25
1907	50c	50c	50c	50c										25c	1.00*	1.25
1908	40c	50c	50c	50c			1c	2c			10c	10c	25c	25c	1.26*	1.37
1909	40c	50c	50c	50c			1c	2c			10c	10c	25c	25c	1.26*	1.37
1910	20c	50c	50c	50c				2c			10c	10c	25c	25c	1.05*	1.37
1911	30c	50c	50c	50c				2c	5c	5c	10c	10c	5c	18c	1.00	1.35
1912	30c	50c	50c	50c				2c	5c	5c	10c	10c	5c	18c	1.00	1.35
1913	35c	50c	50c	50c	10c	10c		2c	15c	15c	5c	10c	10c	18c	1.25	1.55
1914	35c	50c	50c	50c	10c	10c		2c	15c	15c	5c	10c	10c	18c	1.25	1.55
1915	35c	50c	50c	50c	10c	10c		2c	15c	15c	5c	10c	10c	18c	1.25	1.55

---

* Exclusive of 10 cents on the $100 levied for the support of the public library, at that time under the control of the board of education.

tributed a total of $356,016. Gary has provided from local taxes the remainder of the funds required for their current operation expenses, also for fixed charges, and has raised, besides, the equivalent of 39 per cent. of the present investment in grounds, buildings, equipment, and other property, which leaves the schools in debt for 61 per cent. of their present assets.

So much for the financial past. What now of the financial future? The amount of money Gary can raise for public education is limited by state law. Operating under this law, Gary has at no time up to the present been financially able to provide for all the children of the city educational opportunities and facilities such as Emerson and Froebel afford. This, however, is no reason why in the initiation of the proposed system such schools as Emerson and Froebel should not have been built. But it goes without saying that the present inequalities in educational opportunities, except in so far as they arise from the scattered character of the school population, cannot continue indefinitely. In a word, the problem of financing a system of schools such as Gary proposes to establish must sooner or later be faced squarely.

When account is taken of the recent origin, extent, and rapid growth of the city, it is not at all surprising that Gary up to now has not been able to provide equal facilities in all her schools. But will the city be able to do this within, say, the next ten years? The question, of course, can only be answered on the basis of a number of accepted assumptions, such as the following:

(a) That the annual increases in school enrollment for the next ten years—that is, between 1916 and 1926—be the same as the average annual increase between 1911 and 1916;

(b) That the annual increases in the assessed value of property for the decade 1915-1925 be the same as the average annual increase between 1911 and 1915;[1]

(c) That bonds be issued to the maximum amount, 2 per cent. of the taxable wealth, and that the local school tax be kept continuously at the maximum, $1.55 on each $100 of the tax duplicates;

(d) That the present apportionment of state school funds and the present state laws controlling local school taxes and bond issues for school purposes remain unchanged;

(e) That the present official estimate of the per pupil capacity of buildings like Emerson and Froebel (2,300) be made the basis in computing future building needs;

(f) That the present cost per pupil in average daily attendance at Froebel be taken as the basis of computing future administration, operation, and instruction expense; and, finally,

---

[1] The dates for the enrollment and the increase therein are one year later than the dates for the assessed value of property and the increase in such wealth, as the taxes for the support of the schools for any given year are levied on the assessed value of property as of the preceding year; also, a four-year period instead of a five is taken in estimating the annual increase in taxables, because the basis of assessment changes at the end of each fourth year, and the five-year period preceding 1915 covers two such changes, whereas only two will occur in the succeeding ten years. Hence, to base the estimated increase on a five-year period would augment unduly the estimate.

(g) That the present ratio between the current expenditures for administrative and general services and the day school combined, and for all other activities, such as night schools and the like, remain the same—80 per cent. and 20 per cent. respectively.

Proceeding on these assumptions, we shall first consider building needs and the possibility of financing them. The new buildings required by 1926 will depend on the school enrollment at that time, which we estimate at 11,878. This number is arrived at in this way: During the five years 1911-1916 the school enrollment increased 3,112. At the same average annual increase, the increase for the ten-year period 1916-1926 would be double, or 6,224. Adding this estimated increase to the actual enrollment for 1915-1916 (5,654) we obtain a probable enrollment for 1926 of 11,878.

To accommodate this number of pupils at least three new buildings of the Emerson and Froebel type must be provided, even if Glen Park and Jefferson continue to be operated, for experience has demonstrated that school buildings cannot be used in a changing and rapidly growing city at their maximum capacity.[1] To provide three new buildings of the kind contemplated will call, on the basis of the cost of the Froebel plant ($433,517.55), for a capital outlay by 1926 of not less than $1,300,552.65.

The natural source of income for new grounds and buildings is bonds issued against the taxable wealth of

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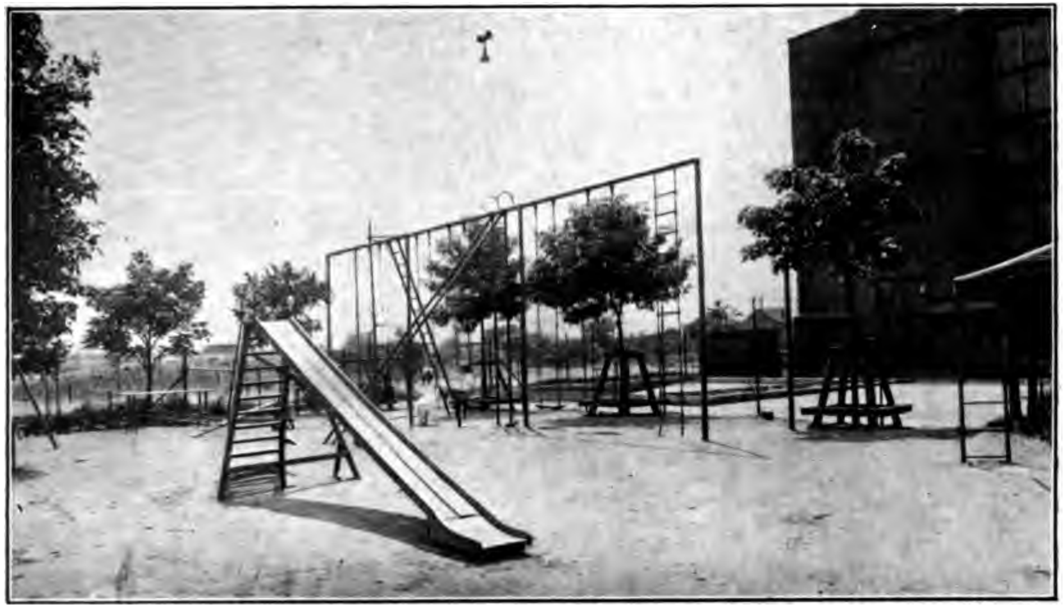
[1] It is interesting to note that to meet present needs and the needs of the immediate future, plans are now under way for two new buildings.



Girls' Playground—Emerson School

the community. The taxable wealth of Gary by 1925 should approximate $51,383,403, for, as taxables increased during the four years 1911-1915 $9,268,785, the increase for the ten years 1915-1925 would at the same average annual increase be $23,171,963. This sum plus the actual duplicate of 1915 ($28,211,440) gives assessed property by 1925 to the amount of $51,383,403.

Against this sum bonds may be issued up to 2 per cent. Gary may therefore raise for new buildings from bonds a total of $1,027,668.06—$272,884.59 less than will be required. Moreover, it is to be remembered that there were on July 31, 1916, bonds outstanding against taxables to the amount of $507,500. Unless these are taken up in the meantime—and for the sake of simplicity we assume they are not—new bonds can be issued only to the extent of $520,168.06, which leaves $780,384.59 to be raised from other sources if the new permanent equipment required by 1926 is to be provided.

The only remaining source of income for grounds and buildings is local taxation. Whether any such amount can be provided from local taxation depends on the margin of income remaining after the current operation expense and the fixed charges of the system are provided out of funds received from the state and raised locally. We estimate[1] that such margin of current income over current expenses will aggregate by 1926 $1,749,824.11. (Table XXX—Appendix).

In addition to the funds that may be raised by bonds,

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[1] For the assumptions on which this estimate is based, see pp. 79-80.

only $780,384.59 is required, as pointed out, to complete the building program we have in mind. Hence, not only this sum can be provided out of the possible margin of income over current expenses, but there will remain a surplus of $969,439.52, which is almost enough to liquidate the bonds now outstanding to the amount of $507,500 and also the bonds aggregating $520,168.06 to be issued to provide by 1926 the required new buildings. In a word, on the bases of the foregoing assumptions, Gary can not only finance within the period in question the proposed school system, but will at the end of the period be practically free of debt for grounds, buildings, and permanent equipment—this, moreover, on the basis of a local school tax rate not appreciably higher, when differences in methods of assessment are taken into account and both operation expense and capital outlay are considered, than the prevailing rate in our larger cities.

Admittedly, material change in any one of a half dozen factors—a more rapid increase in enrollment than is provided for, the possible need of an additional plant owing to the development of widely separated sections, a less rapid and less uniform growth in taxable wealth, higher current operation cost, local opposition to liberal school taxes, and so on—may upset these calculations. Nevertheless, when the future is projected on the basis of known facts, it is clearly evident that Gary is not launched upon a financially impossible educational enterprise.

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Vocation
Local
Ta

Building
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Bo

Summa
Reven
Local
Miscel
Bond

R

1915-16 Revenues
Collections in 1914-1
Collections in 1915-

1916-17 Revenues

Collections in 1915-

R

Revenues 1915-16....
Deficit (unpaid 1915-1

*Includes Compulsory Edu

R

Surplus from 1914-15.
Revenues 1915-16
Available 1915-16..
Available 1916-17..

*Amount in excess of 1915

R

Revenues
Bond *Proceeds*.....

TABLE

Inventory of Land, Build

(Estimated—as of Ju

PLANT	TOTAL
Total	$1,016,319.81
Administration Plant[1]	3,440.73
Emerson School	388,886.07
Froebel School	433,517.55
Jefferson School	98,309.99
Beveridge School	22,614.90
Tolleston School	13,294.05
Glen Park School	30,595.64
24th Ave. School	5,009.25
West Gary School	1,296.23
Clarke School	5,930.73
Ambridge School	3,424.67
School Farm	10,000.00

---

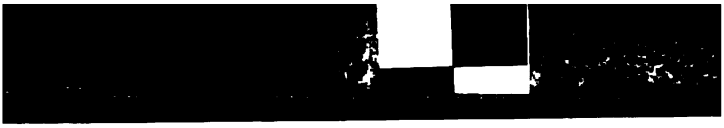
[1] General offices, barns, and storehouses.

TABLE G

STATEMENT OF BONDS OUTSTANDING

(as of July 31, 1916)

SERIES	DATE OF ISSUE	AMOUNT OF ISSUE	DUE
	Issued by School City of Gary		
1	Aug. 1, 1908	$ 37,500	Aug. 1, 1917
2	Nov. 1, 1908	50,000	Jan. 1, 1917
3	Apr. 24, 1909	51,000	Jan. 1, 1919
4	Oct. 15, 1909	50,000	July 1, 1919
5	Feb. 15, 1911	60,000	July 1, 1920
6	Oct. 2, 1911	50,000	July 1, 1921
7	Feb. 17, 1912	75,000	Feb. 1, 1922
8	Nov. 1, 1913	60,000	Nov. 1, 1933
9	Nov. 2, 1914	23,000	Nov. 1, 1924
10	Dec. 1, 1915	50,000	Dec. 1, 1935
	Total Issued by School City	$506,500	
	Inherited Obligation from Calumet Township (Glen Park)	1,000	July 31, 1916
	Total	$507,500	



		DESCRIPTION
[illegible]	[illegible]	
[illegible]	244.00	[illegible] Collection [illegible] Education and Quality Charges
	1,159.00	[illegible]
	[illegible]	[illegible] of Drainage and Flood Control [illegible] Drainage
	[illegible]	[illegible] Lights and Street Service
	[illegible] [illegible]	[illegible] [illegible] Service [illegible] Building Service
[illegible]	2,159.00	[illegible] Services
[illegible] [illegible]	127.00 16.00	[illegible] and Insurance Assessments [illegible] Retirement [illegible] Insurance [illegible] Insurance
[illegible] [illegible] [illegible] [illegible]	[illegible] [illegible] [illegible] [illegible]	[illegible]
[illegible]	[illegible]	[illegible]

INDUSTRIAL WORK

INDUSTRIAL WORK

THE GARY PUBLIC SCHOOLS

The results of the study of the Gary Public Schools, undertaken on the invitation of the Superintendent and the Board of Education of Gary, will be published in eight parts, as follows:

The Gary Schools: A General Account
By Abraham Flexner and Frank P. Bachman
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THE GARY PUBLIC SCHOOLS

INDUSTRIAL WORK

BY
CHARLES R. RICHARDS

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61 Broadway New York
1918

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FOREWORD

THE study of the industrial and art work of the Gary schools made by the author was accomplished during three visits, which together covered a total of four weeks. The periods covered by these visits were as follows: March 5th to March 18th, April 26th to May 4th, and June 4th to June 10th, 1916.

For about three weeks of this time the writer was assisted by Mr. Egbert E. MacNary, Supervisor of Vocational Training, Springfield, Mass., who later rendered invaluable aid in the preparation of the report, and for one week by Mr. Alvin E. Dodd, Secretary of the National Society for the Promotion of Industrial Education.

INTRODUCTION

THE GARY PLAN

In the last few years both laymen and professional educators have engaged in a lively controversy as to the merits and defects, advantages and disadvantages of what has come to be called the Gary idea or the Gary plan. The rapidly increasing literature bearing on the subject is, however, deficient in details and too often partisan in tone. The present study was undertaken by the General Education Board at the request of the Gary school authorities for the purpose of presenting an accurate and comprehensive account of the Gary schools in their significant aspects.

In the several volumes in which the main features of the Gary schools are separately considered, the reader will observe that, after presenting facts, each of the authors discusses or—in technical phrase—attempts to evaluate the Gary plan from the angle of his particular interest. Facts were gathered in a patient, painstaking, and objective fashion; and those who want facts, and facts only, will, it is believed, find them in the descriptive and statistical portions of the respective studies. But the successive volumes will discuss principles, as well as state facts. That is, the authors will not only describe the Gary schools in the frankest manner, as they found them, but they will also endeavor to interpret them in the light of the large educational movement of which they are part. An educational conception may be sound or unsound; any particular effort to embody an educational conception may be adequate or inadequate, effective or ineffective. The public is interested in knowing whether the Gary schools as now conducted are efficient or inefficient; the public is also interested in knowing whether the plan as such is sound or unsound. The present study tries to do justice to both points.

What is the Gary plan?

Perhaps, in the first instance, the essential features of the Gary plan can be made clear, if, instead of trying to tell what the Gary plan is, we tell what it is not. Except for its recent origin and the unusual situation as respects its foreign population, Gary resembles many other industrial centers that are to be found throughout the country. Now, had Gary provided itself with the type of school commonly found in other small industrial American towns, we should find there half a dozen or more square brick "soap-box" buildings, each accommodating a dozen classes pursuing the usual book studies, a playground, with little or no equipment, perhaps a basement room for manual training, a laboratory, and a cooking room for the girls. Had Gary played safe, this is the sort of school and school equipment that it would now possess. Provided with this conventional school

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system, the town would have led a conventional school life—quiet, unoffending, and negatively happy—doing as many others do, doing it about as well as they do it and satisfied to do just that.

As contrasted with education of this meager type, the Gary plan is distinguished by two features, intimately connected with each other:

First—the enrichment and diversification of the curriculum;

Second—the administrative device that, for want of a better name, will be tentatively termed the duplicate school organization.

These two features must first be considered in general terms, if the reader is to understand the detailed description and discussion.

As to the curriculum and school activities. While the practice of education has in large part continued to follow traditional paths, the progressive literature of the subject has abounded in constructive suggestions of far-reaching practical significance. Social, political, and industrial changes have forced upon the school responsibilities formerly laid upon the home. Once the school had mainly to teach the elements of knowledge; now the school is charged with the physical, mental, and social training of the child. To meet these needs a changed and enriched curriculum, including community activities, facilities for recreation, shop work, and household arts, has been urged on the content side of school work; the transformation of school aims and discipline on the basis of modern psychology, ethics, and social philosophy has been for similar reasons recommended on the side of attitude and method.

These things have been in the air. Every one of them has been tried and is being practised in some form or other, somewhere or other. In probably every large city in the country efforts have been made, especially in the more recent school plants, to develop some of the features above mentioned. There has been a distinct, unmistakable, and general trend toward making the school a place where children "live" as well as "learn." This movement did not originate at Gary; nor is Gary its only evidence. It is none the less true that perhaps nowhere else have the schools so deliberately and explicitly avowed this modern policy. The Gary schools are officially described as "work, study, and play" schools—schools, that is, that try to respond adequately to a many-sided responsibility; how far and with what success, the successive reports of the Gary survey will show.

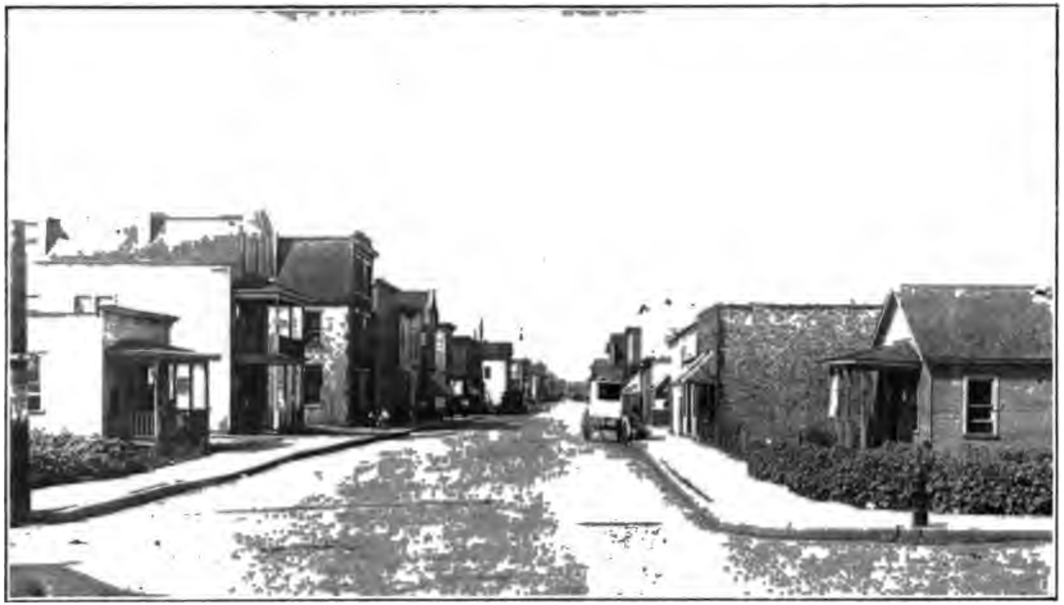
It must not, however, be supposed that the enriched curriculum was applied in its present form at the outset or that it is equally well developed in all the Gary schools. Far from it. There has been a distinct and uneven process of development at Gary; sometimes, as subsequent chapters will show, such rapid and unstable development that our account may in certain respects be obsolete before it is printed. When the Emerson school was opened in 1909, the equipment in laboratories, shops, and museums, while doubtless superior to what was offered by other towns of the Gary type, could have been matched by what was to be found in many of the better favored larger towns and cities at the same period. The gymnasium, for example, was not more than one third its present size; the industrial work was not unprecedented in kind or extent; the boys had woodwork, the girls cooking and sewing. But progress was rapid: painting and printing were added in 1911; the foundry, forge, and machine shop in 1913. The opportunities for girls were enlarged by the addition of the cafeteria in 1913. The auditorium reached its present extended use as recently as the school year 1913–14. The Froebel school, first occupied in the fall of 1912, started with facilities similar to those previously introduced piecemeal into the Emerson.

These facilities, covering in their development a period of years, represent the effort to create an elementary school more nearly adequate to the needs of modern urban life. The curriculum is enriched by various activities in the fields of industry, science, and recreation. Questions as to the efficiency with which these varied activities have been administered will be discussed by the various contributors to the present study. Meanwhile, it is perhaps only fair to point out that the modern movement calls not only for additions to, but eliminations from, the curriculum and for a critical attitude toward the products of classroom teaching. How far, on the academic side, the Gary schools reflect this aspect of the modern movement will also presently appear.

The administrative device—the "duplicate" organization, noted above as the second characteristic feature of the Gary plan—stands on a somewhat different footing, as the following considerations make plain.

Once more, Mr. Wirt was not the inventor of the intensive use of school buildings, though he was among the first—if not the very first—to perceive the purely educational advantage to which the situation could be turned. The rapidity with which American cities have grown has created a difficult problem for school administrators—the problem of providing space and instruction for children who increase in number faster than buildings are constructed. The problem has been handled in various ways. In one place, the regular school day has been shortened and two different sets of children attending at different hours have been taught daily in one building and by one group of teachers. Elsewhere, as in certain high schools, a complete double session has been conducted. The use of one set of schoolrooms for more than one set of children each day did not therefore originate at Gary.

Another point needs to be considered before we discuss the so-called duplicate feature of the Gary plan. In American colleges, subjects have commonly been taught by specialists, not by class teachers. The work is "departmentalized"—to use the technical term. There is a teacher of Latin, a teacher of mathematics, a teacher of physics, who together instruct every class—not a separate teacher of each class in all subjects. Latterly,



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departmentalization has spread from the college into the high school, until nowadays well organized high schools and the upper grades of elementary schools are quite generally "departmentalized," i.e., organized with special teachers for the several subjects, rather than with one teacher for each grade.

Out of these two elements, Gary has evolved an administrative device, the so-called duplicate school, which, from the standpoint of its present educational significance, does indeed represent a definite innovation.

For the sake of clearness, it will be well to explain the theory of the duplicate school by a simplified imaginary example:

Let us suppose that elementary school facilities have to be provided for, say, 1,600 children. If each class is to contain a maximum of 40 children, a schoolhouse of 40 rooms would formerly have been built, with perhaps a few additional rooms, little used, for special activities; except during the recess (12 to 1:30) each recitation room would be in practically continuous use in the old-line subjects from 9 to 3:30, when school is adjourned till next morning. A school plant of this kind may be represented by Figure I, each square representing a schoolroom.

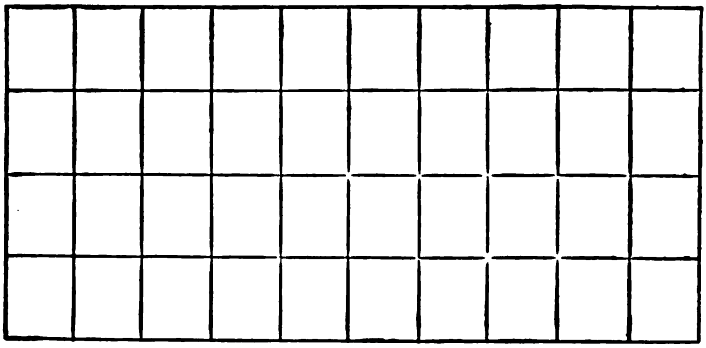
The "duplicate" school proposes a different solution. Instead of providing 40 classrooms for 40 classes, it requires 20 classrooms, capable of holding 800 children; and further, playgrounds, laboratories, shops, gardens, gymnasium, and auditorium, also capable of holding

800 children. If, now, 800 children use the classrooms while 800 are using the other facilities, morning and afternoon, the entire plant accommodates 1,600 pupils throughout the school day; and the curriculum is greatly enriched, since, without taking away anything from their classroom work, they are getting other branches also. A school thus equipped and organized may be represented by Figure II, in which A represents 20 classes taking care of 40 children each (800 children), and B represents special facilities taking care of 800 children. As A and B are in simultaneous operation, 1,600 children are cared for.

FIGURE I

REPRESENTS OLD-FASHIONED SCHOOLHOUSE

40 rooms for 40 classes, of 40 children each, i. e., facilities for the academic instruction of 1,600 children. A school yard and an extra room or two, little used, for special activities, are also usually found.



This method of visualizing the "duplicate" school serves to correct a common misconception. The plan aims to intensify the use of schoolrooms; yet it would be incorrect to say that 20 classrooms, instead of 40, as under the old plan, accommodate 1,600 children. For while the number of classrooms has been reduced from 40 to 20, special facilities of equal capacity have been added in the form of auditorium, shops, playground, etc. The 20 classrooms apparently saved have been replaced by special facilities of one kind or another. The so-called duplicate organization and the longer school day make it possible to give larger facilities to twice as many children as the classrooms alone would accommodate. The duplicate school, as developed at Gary, is not therefore a device to relieve congestion or to reduce expense, but the natural result of efforts to provide a richer school life for all children.

FIGURE II

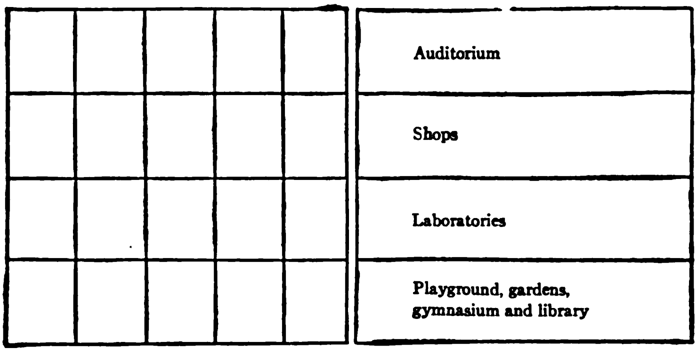
REPRESENTS THE GARY EQUIPMENT

A

20 classrooms for academic instruction of 20 classes of 40 children each (800 children) in the morning hours and an equal number in the afternoon (1,600 in all daily)

B

Special facilities, taking care of 800 children in the morning hours and an equal number in the afternoon hours (1,600 in all daily)



The enriched curriculum and the duplicate organization support each other. The social situation requires a scheme of education fairly adequate to the entire scope of the child's activities and possibilities; this cannot be achieved without a longer school day and a more varied school equipment. The duplicate school endeavors to give the longer day, the richer curriculum, and the more varied activities with the lowest possible investment in, and the most intensive use of, the school plant. The so-called duplicate school is thus a single school with two different types of facilities in more or less constant and simultaneous operation, morning and afternoon.

Such is the Gary plan in conception. What about the execution? Is it realized at Gary? Does it work? What is involved as respects space, investment, etc., when ordinary classrooms are replaced by shops, playgrounds, and laboratories? Can a given equipment in the way of auditorium, shops, etc., handle precisely the same number of children accommodated in the classrooms without doing violence to their educational needs on the one hand, and without waste through temporary disuse of the special facilities, on the other? To what extent has Gary modified or reorganized on modern lines the treatment of the common classroom subjects? How efficient is instruction in the usual academic studies as well as in the newer or so-called modern subjects and activities? Is the plan economical in the sense that equal educational advantages cannot be procured by any other scheme except at greater cost? These and other questions as to the execution of the Gary plan are, as far as data were obtainable, discussed in the separate volumes making up the present survey.

The concrete questions above mentioned do not, however, exhaust the educational values of a given school situation. From every school system there come imponderable products, bad as well as good. Aside from all else, many observers of the Gary schools report one such imponderable in the form of a spiritual something which can hardly be included in a study of administration and eludes the testing of classroom work. These observers have no way of knowing whether Gary school costs are high or low; whether the pupils spell and add as well as children do elsewhere; but, however these things may be, they usually describe the pupils as characterized by self-possession, resourcefulness, and happiness to an unusual degree. While different schools and indeed different parts of the same school vary in this respect, the members of the survey staff agree that, on the whole, there is a basis of fact for these observations. Gary is thus something more than a school organization characterized by the two main features above discussed.

The reason is not far to seek. Innovation is stimulating, just as conformity is deadening. Experiment is in this sense a thing wholesome in itself. Of course it must be held to strict accountability for results; and this study is the work of persons who, convinced of the necessity of educational progress, are at the same time solicitous that the outcome be carefully observed. The fact that customary school procedure does not rest upon a scientific basis, does not willingly submit itself to thorough scrutiny, is no reason for exempting educational innovations from strict accountability. The very reverse is indeed true; for otherwise innovation may imperil or sacrifice essential educational values, without actually knowing whether or not it has achieved definite values of its own. Faith in a new program does not absolve the reformer from a watchful and critical attitude toward results. Moreover, if the innovator formulates his purposes in definite terms and measures his results in the light of his professed aims, the conservative cannot permanently escape the same process. Gary, like all other educational experiments, must be held accountable in this fashion. Subject however to such accountability, the breaking of the conventional school framework, the introduction of new subject matter or equipment, even administrative reorganization, at Gary as elsewhere, tend to favor a fresher, more vigorous interest and spirit. Defects will in the following pages be pointed out in the Gary schools—defects of organization, of administration, of instruction. But there is for the reasons just suggested something in the Gary schools over and above the Gary plan. Problems abound, as in every living and developing situation. But the problems are the problems of life, and, as such, are in the long run perhaps more hopeful than the relatively smooth functioning of a stationary school system. Thus, not-

Emerson School Building

withstanding the defects and shortcomings which this study will candidly point out, the experiment at Gary rightly observed and interpreted is both interesting and stimulating.

INDUSTRIAL WORK

INDUSTRIAL WORK

I. SHOP WORK IN GARY SCHOOLS

ALMOST from the establishment of the Gary school system some form of constructive work has been a feature of the regular school course. Before the Emerson and Froebel schools were built this took the form of such manual training as could be carried on in one or two shops supplied with simple equipment, or such handwork as could be performed in the regular classrooms. The first of these manual training shops was installed in the Jefferson school in 1908.

DEVELOPMENT OF THE SHOP WORK

When the Emerson school was built in 1909 two shops were equipped for manual training woodworking and placed in charge of licensed manual training teachers. Two years later these shops were given up, and cabinet making, painting, and printing shops were equipped in their stead. At this time a radical departure in the plan of industrial work was inaugurated. Artisan-teachers were employed and the work placed on a productive or maintenance and repair basis. In 1912 three metal shops (foundry, forge, and machine) were equipped in this school and operated on the same productive basis.

This change was made, according to the shop supervisor, both because of the conviction that experience in practical productive work was far more truly educative and stimulating in its influence upon the pupils and because of the economic advantage resulting from applying the work of teacher and pupils to the maintenance and upkeep of the school plant.

When the Froebel school was built in 1912 the industrial work was at first confined to a manual training shop and a cabinet shop. Shortly afterward sheet metal, plumbing, printing, and painting shops were added, and in the fall of 1914 a shoe shop and a pottery were installed.

During the period covered by the present survey the following shops were in operation in the Emerson school: printing, foundry, forge, and machine. The so-called cabinet making and pattern shops had been discontinued at the end of the school year 1914–15 on account of the expense involved as compared with the maintenance returns and the small number of pupils electing these branches.

In the Froebel school the plumbing, sheet metal, printing, and painting shops were being operated on a productive basis as well as the shoe repair shop. The carpentry shop, with its equipment of mill tools which had been operated by the older boys (the state law forbidding boys below 16 to operate such tools), was discontinued about the end of March and a woodworking bench shop was being maintained for the younger boys on practically a manual training basis. The pottery or clay working shop had been discontinued because of the difficulty in finding a suitable instructor.

AIM OF THE WORK AND SHOP INSTRUCTORS

The aim of all this shop work, as stated by the shop supervisor, is enrichment of the school experience and prevocational training to the end of better preparation for and more intelligent selection of an occupation.[1] The shops are in charge of journeymen mechanics who are paid the union scale of wages. In the plant day of eight hours these men, as a rule, give seven hours to class work. They are not licensed teachers, and, because of this fact, Gary is not eligible to receive state funds for the industrial work done in its schools.

Partly because of the above situation and partly because of the economic function of the shops, the shopmen are not listed as instructors in the school records, but as workers in a department of maintenance and repair, the records of which are supposed to show the relation between cost and returns.

It should be noted at the outset that these men constitute a superior body of industrial teachers. They have evidently been selected with care not only as to knowledge of their trades, but as to personal qualities of intelligence, kindliness, and sympathy for young boys. It should also be made clear that, whatever may be the limitations of the Gary shop work in regard to breadth of instruction, the instructors are sincerely trying to help the boys under them and to teach them right methods of work. The pupils are not left to take care of themselves except in certain cases to be referred to later, but receive due attention as far as the exigencies of a maintenance shop scheme will permit. As teachers, these men, of course, represent varying capacities. Some have the making of excellent instructors, others are not strong in analyzing and organizing their material, and still others fail in presenting material to their pupils. As a group, with perhaps one exception, they lack appreciation of and skill in certain essentials of good teaching, such as bringing out the reasons for their methods of work, developing related information concerning tools, processes, and materials from shop experiences and drawing ideas from their pupils by question and suggestion. On the whole, however, they compare favorably with a like number of trained manual training teachers possessing broader academic schooling and less practical experience.

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[1] For further statement see p. 106.

TIME SCHEDULE IN THE EMERSON SCHOOL

The plan of distribution of daily time in the Emerson school during the year 1915–16 was as follows:

GRADES 1, 2, AND 3

2 hours	Academic work
1 "	Handwork and drawing
1 "	Nature study

2 hours	Play
1 “	Auditorium
1 “	Lunch
	GRADES 4 AND 5
3 hours	Academic work
2 “	Helpers in shops, laboratories, or studios
1 “	Play
1 “	Auditorium
1 “	Lunch
	GRADES 6, 7, AND 8
3 hours	Academic work
2 “	Drawing, shop work, science, or as teachers' assistants
1 “	Gymnasium and play
1 “	Auditorium
1 “	Lunch

It should be noted that this schedule means that all pupils from the fourth to the eighth grade are supposed to receive some kind of shop experience each year.

In this school the terms are thirteen weeks in length, making three in the regular school year.

In grades 4 to 8 the theoretical policy is to rotate the pupils by terms in the departments of science, drawing, and shop work, provided parents do not object or difficulties of program do not stand in the way. In following out this scheme the time distribution would be as follows: 1 term, 2 hours science; 1 term, 2 hours shop work; 1 term, 1 hour drawing and 1 hour elective. This elective hour may be given to shop work if so desired.

This theoretical plan seems to be very loosely adhered to in actual practice, the desire of the pupil, at least in the upper grades, being apparently the main determining factor in regard to the disposition of this period, as cases were frequently met where pupils had been in one shop for an entire year, and cases where a pupil had had several shop terms but no experience in mechanical drawing.

Out of 20 cases of shop pupils in which special records were obtained, 11 had taken some form of shop work in each of the three terms of 1915–16, 7 had elected this work for two terms, and only 2 had had but one term of shop and one term of mechanical drawing. The record of these pupils for previous years was very much the same. In many cases every term for three years and some times for four years had contained shop work.

When the cases of all the pupils taking work in the year 1915–16 in one or the other of the four shops studied at the Emerson school were investigated, the following situation was found:

TABLE I

SHOP ENROLLMENT AT EMERSON BY TERMS

	TOTAL ENROLLED DURING THE YEAR	NO. IN SHOP BUT ONE TERM	NO. REMAINING IN SHOP TWO TERMS	NO. REMAINING IN SHOP THREE TERMS
Machine Shop	38	23	8	7
Forge Shop .	91	74	16	1
Foundry . .	92	71	20	1
Printing . .	68	52	16	

It is evident from the special study referred to above that many pupils taking but one term in a certain shop went into another shop for a second term and perhaps for a third term.

The theoretical plan calling for a two hour period for shop work seems also to be very loosely carried out in practice, the large majority of pupils being enrolled for but one hour daily. The distribution in this regard was found to be as follows:

TABLE II

SHOP ENROLLMENT AT EMERSON BY HOURS

	PUPILS ENROLLED FOR ONE HOUR	PUPILS ENROLLED FOR TWO HOURS	PUPILS ENROLLED FOR THREE HOURS
Machine Shop:			
First Term	22	1	
Second Term	14	5	2
Third Term	12	4	
Forge Shop:			
First Term	16	18	
Second Term	39	8	1
Third Term	16	9	
Foundry:			
First Term	22	16	
Second Term	21	8	
Third Term	37	16	
Printing Shop:			
First Term	17	19	
Second Term	33		
Third Term	11	4	

The assignment of pupils in regard to the main divisions of shop work, drawing, or science is determined by the program of the school. For those designated to shop work the assignment to a particular shop is made by a young woman clerk in the shop supervisor's office. As far as could be ascertained, no element of discrimination on the part of the authorities enters into this assignment, the wish of the pupil being the sole determining factor. If the particular shop desired has its full complement, the second choice is brought into play. Whether the shop is the same as that chosen the year before seems to receive little or no consideration. This situation seems one calling for rather more serious treatment. The choice of shop work is often a matter of very superficial causes and accidental circumstances. This fact was substantiated by many questions addressed to the pupils.

Whatever degree of importance may be attached to freedom of choice on the part of the pupil, intelligent and sympathetic counsel could hardly fail to make these shop elections more profitable. By such means considerations could be developed readily which would open up new points of view to the pupil and in most cases, at least, result in more serious thought being brought to bear on the matter.

In a system where election on the part of young people plays such a large rôle, it would seem that provisions to this end are almost essential and that in each school there should be a well equipped person, competent in this kind of counsel, who should give time to both group and individual conferences upon this subject.

TIME SCHEDULE IN THE FROEBEL SCHOOL

In the Froebel school the length of term is ten weeks, and the plan of time distribution as follows:

GRADES 1, 2, AND 3

2 hours	Academic work
2 "	Handwork, drawing, nature study, music and application
2 "	Play
1 "	Auditorium
1 "	Lunch

These classes are scheduled for "an average of 30 minutes a day for application work. The remaining 90 minutes are divided between music and expression, manual training and drawing, and nature study by days, weeks, months, or terms, so that each of these departments receives an average of 30 minutes per day."

GRADES 4 AND 5

3 hours	Academic work
2 "	Helpers in shops, laboratories, studios, or in application work
1 "	Play
1 "	Auditorium
1 "	Lunch

As in the case of the Emerson school many of the assignments of pupils to shops or science laboratories in the earlier grades are made under the guise of "helpers." On the back of the Froebel school program appears the following:

> "HELPERS
>
> "Classes 25 to 36, representing 4th and 5th grade pupils, are too old for the primary manual training and nature study and not quite old enough to use profitably the advanced laboratories and work shops as independent students. They are, therefore, assigned as assistants to students in classes 37 to 72. It has been demonstrated that these children learn more working with older students than they can be taught in separate classes by themselves. It is desired that the entire school be as much as possible like a family wherein the younger children are learning consciously and unconsciously from the older children and the latter from contact with the younger children are learning to assume responsibility and take the initiative. Someone has said that we send our boy to school but his playmates, not the school faculty, educate him. This is true because in the traditional school the faculty does not utilize the playmates as assistant instructors."

Whatever the theory held or expressed in regard to this plan of learning, the observed facts of practice, as far as the shops are concerned, are that these younger children are not really employed to assist the older boys, but constitute groups of pupils to which definite tasks are assigned and to which the instructors give time and attention in the same manner though not always to the same degree as with the older boys.

The deviation from, or perhaps one might better say abandonment of, the helper principle as formulated above is apparent in the actual shop assignments. For example, in the forge shop and in the foundry at the Emerson school classes are found consisting of 9 to 16 third, fourth, or fifth grade pupils with one or two older boys, and classes of 12 to 16 fourth grade pupils without any older boys. In each of the above instances the third, fourth, or fifth grade pupils are noted as "helpers" on the program.

On the other hand, in the Froebel school program of February, 1916, the majority of regular assignments (not as helpers) in the printing, plumbing, and painting shops consist of fourth and fifth grade classes without admixture of older pupils.

Grades 6, 7, and 8

3	hours	Academic work
2	"	Drawing, shop work, science, or as teachers' assistants
1	"	Gymnasium and play
1	"	Auditorium
1	"	Lunch

Under the four term arrangement these pupils are supposed to be assigned for one term each as follows: drawing, shop work, science, and work as teachers' assistants.

As in the case of the Emerson school, this plan does not seem to be at all closely followed, and individual inclination appears to play a determining part in deciding how closely the theoretical cycle obtains. Of 28 pupils from whom special records were obtained, 5 had taken some form of shop work in each of the four terms of 1915–16; 4 had three terms of shop work and one term as store attendant; 4, three terms of shop and one of mechanical drawing; 6, three terms of shop work; 2, two terms of shop and one of mechanical drawing; 6, two terms of shop work. In only one case had the pupil had but one term of shop work during the year. In the previous years the records of these pupils were very similar.

The situation in regard to all pupils taking shop work is shown below:

TABLE III

Shop Enrollment at Froebel by Terms

	TOTAL ENROLLED DURING THE YEAR	NO. IN SHOP BUT ONE TERM	NO. REMAINING IN SHOP TWO TERMS	NO. REMAINING IN SHOP THREE TERMS
Printing . .	72	57	11	4
Woodworking	162	135	23	4
Sheet Metal .	124	108	14	2
Plumbing .	100	80	15	5
Painting . .	110	84	19	7
Shoe Shop .	132	102	28	2

The remark made in connection with the Emerson pupils, viz., that many of those noted above as taking but one term in one shop undoubtedly have taken one or two further terms in other shops during the same year, applies with even greater force to the Froebel pupils.

For three of the four terms, conditions as to numbers taking one or two hours for the shop work period are indicated in Table IV.

TABLE IV

SHOP ENROLLMENT AT FROEBEL BY HOURS

	PUPILS ENROLLED FOR ONE HOUR	PUPILS ENROLLED FOR TWO HOURS	PUPILS ENROLLED FOR THREE HOURS
Printing:			
First Term	5	20	1
Second Term	7	7	
Fourth Term	19	13	
Woodworking:			
First Term	16	21	1
Second Term	39	18	1
Fourth Term	73	23	
Sheet Metal:			
First Term	25	16	
Second Term	31	14	1
Fourth Term	54	1	
Plumbing:			
First Term	39	7	
Second Term	35	8	1
Fourth Term	27	8	
Painting:			
First Term	31	18	
Second Term	31	15	
Fourth Term	42	5	
Shoe Shop:			
First Term	41	14	
Second Term	47	15	
Fourth Term	41	2	

In this school the distribution of pupils to the various shops is made by an instructor who gives part of his time to manual training teaching and who, according to the shop supervisor, may be appointed some time in the future as vocational counselor. During the period of the survey, however, it was evident that very little attention was being given even in this school to serious counsel with pupils as to their shop elections.

On the Froebel school program it is stated that the practice obtains of presenting by talks in the auditorium the advantages and disadvantages of each of the school trades as an occupation. No presentation of this kind occurred during the four weeks spent by the writer in the Gary schools. The shop supervisor, however, assured the writer that such talks were given from time to time.

INDUSTRIAL WORK IN THE HIGH SCHOOLS

The high school program for both Emerson and Froebel is as follows:

3 hours	Academic work
2 "	Shop work, drawing, or science laboratory
1 "	Gymnasium
1 "	Auditorium
1 "	Lunch

In the high schools the shop work and drawing are purely elective subjects and the courses are arranged on the basis of half year terms.

The state requirements for graduation for approved high schools are 15 units, 9 of which are specified, leaving 6 as elective. Some colleges accept shop work and drawing for admission, allowing two credits, others allow one credit for such work and still others none.

This situation has considerable bearing on the election of shop work in the high schools, as most of the pupils by the time they reach the third or fourth year are concerned with the successful completion of their required subjects, and, in case of those looking forward to college, of such subjects as will be acceptable to the institution selected. In consequence, practically all students take the courses in physics and chemistry during the third and fourth years and thus restrict their election of shop work and drawing to the first and second high school years.

NUMBER OF PUPILS IN SHOPS

Most persons seeing the Gary shop work for the first time are surprised by the small numbers in the shop groups, which varied during 1915–16 from 1 to 20 pupils. These small numbers, however, result naturally from the operation of the program and the relation of the number of shops to the size of the schools. For example, the Froebel school enrolled during the school year 1915–1916 approximately 400 boys in grades 4 to 8. In this school there are four terms in the regular school year and pupils in the above grades are supposed to have shop work for but one term a year. If the theoretical schedule is followed and the number assigned to shop work is the same each term, there would consequently be in the shops from the above grades 100 pupils each term. In this school there are five shops in operation exclusive of the shoe shop and for purposes of this calculation we may say that three double periods are daily available in each. This admits of fifteen program sections with an average number in each section of six to seven pupils. To this number should be added a small constant to represent the high school pupils who elect shop work. The fact that the large majority of these pupils are in shops for a single and not a double period daily acts to reduce the average numbers in the groups, while, on the other hand, the tendency of pupils to take more than one shop term during the year tends to counteract this influence and raise the numbers.

The actual size of the several shop groups during 1915–16 for the Froebel school, exclusive of the shoe shop, is shown in Fig. 1. In order to bring out the situation as completely as possible, the totals representing each size of unit group for each of the four terms have been added together and shown in the curve.

In the Emerson school the total enrollment is much smaller than in Froebel and the number of shops (four) almost as great. This results in even smaller shop groups, as Fig. 2 indicates.

YOUNG PUPILS IN SHOPS

The presence of the younger pupils in the shops, already noted, is a feature that has interested all students of the Gary schools. As has been stated, a number of boys from the third grade were found in the shops at the time of the survey and the schedules provide shop work in two hour periods as a regular feature for fourth and fifth grade pupils as well as the more advanced grades.

The actual value of their shop experiences to these younger pupils is not easily appraised. The real ques-

FIGURE 1
SIZE OF SHOP GROUPS—FROEBEL SCHOOL

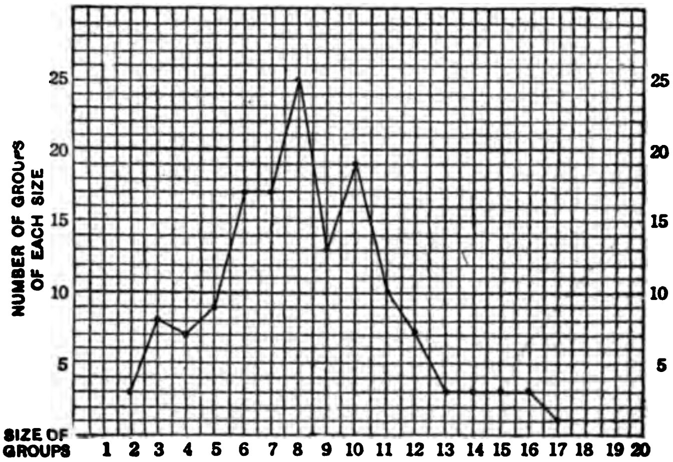
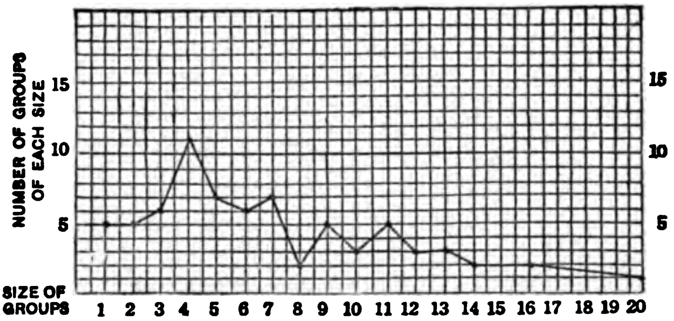
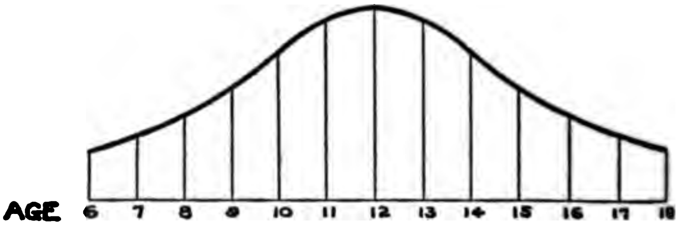


FIGURE 2
SIZE OF SHOP GROUPS—EMERSON SCHOOL



tion is, of course, whether for the period in which the pupil is in school the shop experience is of as much value as the same time spent in other school activities. To answer this in any positive or authoritative way, we need to know many things of which we are now ignorant. We need to know first of all the relative extent to which children assimilate experiences at different ages. If we could, for instance, plot a curve as below[1] which would show the relative degrees in which woodworking ideas are assimilated at different ages we should have something definite from which to start in this particular field.

We should probably also need another curve, indicating the relative stimulative effects of such experiences. From such data we should be able to judge fairly well at what points woodworking would be most worth while in the school system and most justify its expense. Furthermore, if we could also plot similar curves for other school activities, we could form some just ideas as to relative values. Lacking such knowledge it is difficult



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[1] The curve is drawn merely to make clear the point at issue and does not attempt to indicate the degree in which woodworking ideas are assimilated at different ages.

to see how accurate and authoritative pronouncements can be made as to the exact stages at which these shop experiences become worth while.

Certain results of observation in the Gary shops, and answers to many questions addressed to pupils, together with opinions of instructors, can, however, be set down. In the case of third grade children, who were found in considerable numbers in some of the shops despite the theoretical schedule, it is the judgment of the author that pupils at this level have too little power of sustained attention, too little mental development, and, for some shops, not enough physical strength to gain advantage from the work. In the case of fourth and fifth grade pupils the phenomena are not so definite and need to be considered in relation to the different shops. For the machine shop these young children are obviously unfitted and none were found there. In the forge shops they potter away ineffectually at work beyond their strength and skill. In the foundry, however, barring the lifting of the loaded flasks, they can not only appreciate the common processes, but they can master the simpler operations. In printing, the exacting work of typesetting requires more care and patience than boys or girls of this age are capable of. In woodworking, simple work can be satisfactorily accomplished and this is to a small extent perhaps true of elementary tinsmithing. The work of cutting and threading pipe in the plumbing shop requires more strength and muscular coördination than boys of this age can bring to bear.

In painting, very simple work can probably be accomplished, but it is doubtful if sustained efforts can be counted upon for a two hour period. In the shoe shop, substantial though somewhat rough work can be done by these pupils.

Taking the situation somewhat in the rough, it would seem true that the presence of these pupils in the forge, printing, and plumbing shops results in extremely little value to the individuals and that the only shops for which any argument can be made are the woodworking, painting, and shoe repairing, and to some extent the foundry. Even with this assumption, it still remains an open question whether provisions for work in special shops for these grades return an educational value in proportion to their cost.

Whether these shop experiences are of more value than the same time out of school with the boy left to his own devices it is not easy to say. Even if answered in the affirmative, the results do not seem sufficiently positive to serve as a basis for an educational program which involves the encroachment of fourth and fifth grade pupils upon the time of trade instructors and the use by them of expensive special shops.

Such considerations perhaps tend to raise the question whether a school program providing a uniform number of hours per day for all grades is necessarily the best plan or whether a program embodying a lesser number of hours as well as different elements of instruction for the grades below the sixth might not be advisable.

On the other hand, whether experiences in some of these shops for pupils from the fourth and fifth grades are of equal or superior value to work involving the same amount of time in other school branches is a question beyond the writer's power to decide. It does seem clear to him, however, that as far as industrial work is concerned, fully as valuable results could be secured from instruction in a manual training room equipped for a variety of industrial processes, such as benchwork in wood, work in clay and cement, and, perhaps, in simple molding and casting, and presided over by a teacher not of the artisan type. With any form of industrial work for these grades, it does not seem desirable to make the periods more than an hour in length.

GIRLS IN THE SHOPS

During the period of the survey and at other times during 1915–16, a small number of girls were enrolled in certain of the shop classes.

They were found as regularly assigned workers in the foundry and print shop of the Emerson school and in the tinsmithing classes of the Froebel, and as observers in the plumbing shop. The writer has no desire to enter into an extended discussion of this situation and must content himself with a few observations. In the printing shop the girls seem thoroughly at home in their work, and, whether viewed from the side of prevocational experience or as a cultural element, there appears to be no reason why the work in this shop should not be as valuable or nearly as valuable to them as to the boys.

In the case of the girl observers in the plumbing shop, if care were taken to bring out the hygienic and physical principles underlying proper plumbing construction, it is clear that something of real value could be brought out for the future home maker and home keeper. As far as the foundry and sheet metal shops are concerned, it is very difficult for the writer to conceive that actual manual experiences in these shops, whether viewed from the standpoint of ideas bearing on the conduct of a household, of information contributing to general culture, or of prevocational training, are capable of returning as much value as experience in other activities more closely related either to home making or to careers open to and desirable for women.

II. SHOPS AND TESTS IN EMERSON SCHOOL

AS PREVIOUSLY noted, the shops studied in the Emerson school were those in operation at the time of the survey, viz., the machine shop, forge shop, foundry, and printing shop, the carpentry or cabinet making shop and pattern shop being idle at this time. All of these shops are located on the ground floor, the machine shop and printing shop at the front of the building, and the other two in a one story rear extension.

MACHINE SHOP

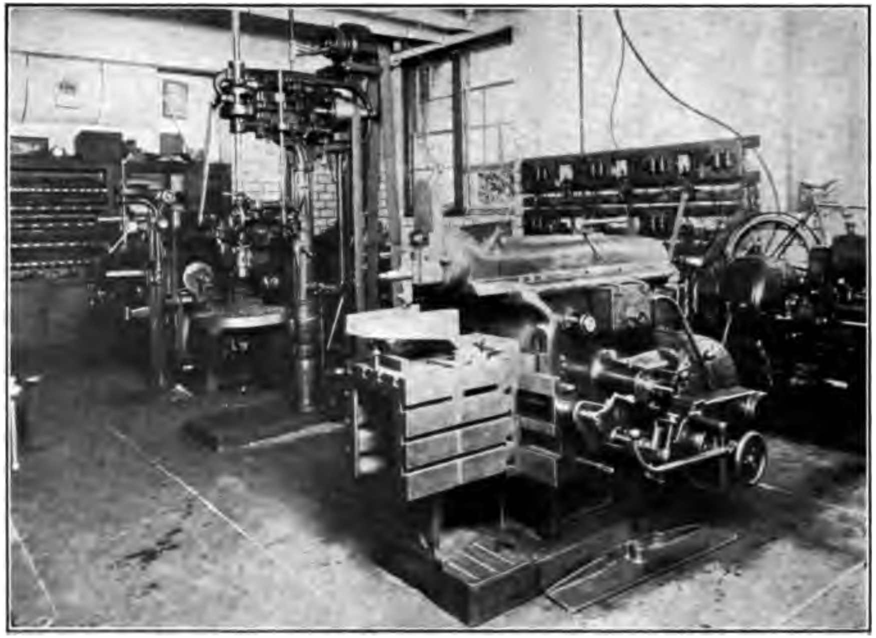
The machine shop, 21 ft. x 35 ft., is well lighted by windows on one of the long sides. It is equipped as follows: three engine turning screw cutting lathes, one 22 in. x 14 ft., one 18 in. x 10 ft., one 14 in. x 6 ft.; one universal milling machine; one 24 in. shaper; one 27 in. vertical drill with power feed; one small vertical drill, hand feed; one emery tool grinder. All of the above are equipped with individual electrical motor drives. A bench equipped with five vises runs along the side of the shop, opposite the windows. A high cupboard for small tools occupies one end wall. There is no blackboard. The cost of the equipment is stated as $8,102.64.

The productive and repair work in this shop executed in whole or part by student workers during the year 1915–16, along with the value of the material used, labor cost and the instructor's estimate of the market value of the product, is reported to include the items given in Table I of the Appendix. In addition there were many small jobs of drilling and repairing, some facing of valve seats, turning of motor commutators, and tapping and threading of pipes, bolts, and nuts.

In the case of each of the shops a number of items reported to have been executed by the pupils were inspected and it may be noted at this point that in all cases observed the workmanship was found to be thoroughly creditable. Of course, the amount of participation on the part of the instructor in any instance could not be accurately determined.

The full capacity of the shop, with each of the machine tools except the small drill in use and one boy at the bench, is seven. During the period of the survey the number of pupils in the shop groups in any one period varied from three to six. Of the total number of pupils in this shop during this time, two came from the seventh grade, eleven from the ninth or first year high school, five from the tenth, and one from the eleventh grade. The ages of the high school pupils ranged from fourteen to sixteen years.

In the instructor's opinion the boys best fitted to benefit from this shop and best fitted for productive work are those of the first and second years of the high school, that is, the oldest boys commonly available under



Machine Shop—Emerson School

the operation of the high school schedule. He believes that five represents the maximum number that it is practicable to handle under a productive scheme.

The instructor's policy as to sequence of tool work is as follows: bench work for a week or two (not much bench work is available in the common run of repairs), drill press for two months if possible, shaper for four months. This plan is sometimes impracticable because there are not enough tools. Following the above comes three months' work on the lathe. Ordinarily, students do not reach the milling machine before the fourth term, and, as the average stay in the shop is three terms, only a few come into contact with this tool.

Observation brings out very clearly the fact that in this shop, constantly faced as it is with the exacting requirements of production or repair work, the instructor's whole time and energy are taken up with starting and guiding his boys on particular jobs. Oftentimes, he must take a hand himself both at laying out and executing particularly difficult operations. If the work is not to be spoiled and successful repairs or new apparatus is to be turned out, there is no time for widening the boy's intellectual return beyond the immediate experience—no time to point out other ways of reaching the same result, no time to indicate how larger work is executed in commercial shops or how special tools are employed for quantity production, no time even to instruct the pupils as to the qualities of the materials machined or used in cutting tools, no time even to give them an understanding of the mechanism of the tools they use beyond a knowledge of what levers are to be moved to obtain certain results.

In the work observed the boys appeared to show very fair skill, but it is not clear that they had received a breadth of experience commensurate with the time spent in the shop. They all showed much confidence and readiness in approaching work similar to that which they had already undertaken, but the examination hereafter described indicates that they found it difficult to meet slightly different situations from those with which they had already dealt. In fact, this practical test failed to show that the boys in the group examined had developed any exceptional power of resourcefulness or capacity to think out special means to meet a new situation.

Practical tests were made in eight of the shops, as it was apparent that the extremely varied work being conducted at the time of the survey, and the fact that each pupil was likely to be engaged upon work which differed from that of the others in his section, rendered it impossible to develop any standard of rating without a test embodying typical operations.

In each case the character of test was discussed beforehand with the shop instructor and in every instance approved by him as thoroughly fair and competent.

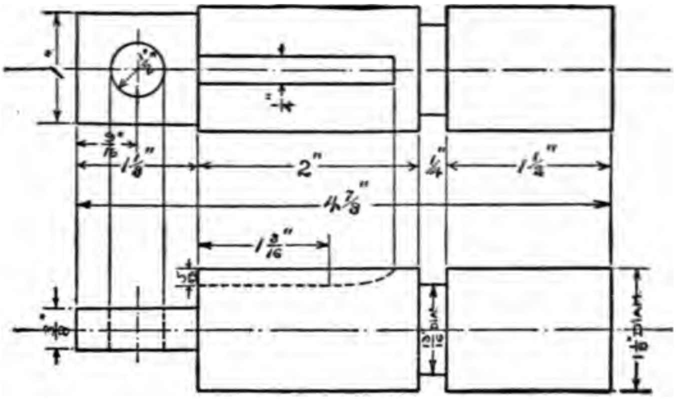
Seven boys who had had the longest experience in the machine work were selected for the practical test in this shop. These boys were from the first, second, and third years of the high school and were either fifteen or sixteen years of age. They had all had work on the lathe, drill press, shaper and bench, and all but one on the milling machine. Five of these boys finished their pieces under the observation of the examiner. The test is described in detail in II-A of the Appendix.

Each was given the drawing shown below and a piece of soft rolled steel 1¼ in. in diameter and 5 in. long. All but one, who had had no mechanical drawing, had no difficulty in reading the blueprint and proceeded to lay out and punch centers on the ends of the piece and to drill and countersink the same.

Figure 3

TEST PIECE–MACHINE SHOP.

ACCURACY OF MEASUREMENTS WILL BE RATED.



They all surfaced the piece in a way that showed familiarity with the operation, although only two trued up the ends before the surface cuts, each one attempting to bring the diameter to within $\frac{1}{1000}$ in. of the indicated size to allow for a file finish. Measuring for the position of the groove gave them some trouble, but all used the proper tool for cutting. They experienced most difficulty with the work in the shaper, particularly in regard to methods of measurement and in properly clamping the piece in vise.

All those who had had experience on the milling machine showed understanding of its operating parts and interpreted the depth of slot in decimal equivalents and gauged depth of cut by index wheel on the elevating screw. Each one also showed appreciation of the need of care to obtain an accurately centered and accurately sized hole when drilling the piece.

In the matter of speed great differences appeared. The time consumed in finishing the test ranged from 4 hours 29 minutes to 9 hours 55 minutes. These differences are perhaps no more than natural for boys of this age, but they seem to indicate that speed had received little attention as one of the important elements in a productive policy.

On the whole, the boys showed confidence, familiarity, and a fair degree of skill in dealing with the common machine shop operations, but, as indicated by the written test and many oral questions, their comprehension of machine work and their own machine shop stopped pretty near the surface. They had apparently never been brought together for any instruction as to the mechanism of the various tools they operated or as to the nature of the materials used, or informed about other methods of machine work used in commercial shops, or given any appreciation of the place the machine shop occupies in the industrial world.

Written tests were also given in each of the shops studied with the exception of that in woodworking. These tests were carefully explained and the endeavor was made to have the pupils put down their ideas in the form natural to them. It was explained that it was not the object of the tests to make school ratings, but to ascertain what the Gary school pupils knew about the thing they were doing in their shop work. Many oral questions during the period of the survey substantiated the conclusions drawn from the tests.

The written test was given to six boys who had taken the practical examination in the machine shop and one boy (ninth grade, fifteen years old) who had not taken it. This test was as follows:

1. Why is oil not needed in cutting with tools of high-speed steel?

   With what metals is oil necessary when using tools of ordinary tool steel? Why?

2. Describe the mechanism between the cone spindle and the tool carriage used in cutting threads in the lathe.

   Describe the mechanism which produces the feed in cylindrical turning.

3. For what kinds of work are milling machines used?
   Are there other kinds of milling machines than the one used in the school shop?
4. Name all the other machine tools you know that are not in the school shop, and state for what they are used.
   On what kind of a tool is the inside surface of a large engine cylinder cut?
5. What is the proper cutting speed for cast iron? For soft steel?
   How would you find the surface speed of a pulley 10 inches in diameter, in feet per minute?
6. What are the advantages of the individual motor drives used in the school shop? What are the disadvantages?
7. Why are machine tools so important and so much used in manufacturing as compared with hand work?
   What kinds of manufacturing, in which machine work is used, are found in Gary?

The answers are summarized below:

1. Why is oil not needed in cutting with tools of high-speed steel?
   With what metals is oil necessary when using tools of ordinary tool steel? Why?

No one suggested that cutting tools of high-speed steel retain their temper at very high temperatures and that oil is needed with cutting tools of ordinary tool steel when operating on steel or wrought iron in order to reduce the friction heat which would otherwise cause loss of temper. No reference to hardening or tempering appeared in the answers.

2. Describe the mechanism between the cone spindle and the tool carriage used in cutting threads in the lathe.
   Describe the mechanism which produces the feed in cylindrical turning.

In most cases no attempt was made to answer this question. The two pupils who answered described the method of moving the levers for screw cutting and of throwing in the friction feed for ordinary turning by turning a screw. Neither answer suggested any understanding of the mechanism concealed by the headstock of the lathe or by the apron of the carriage. After the examination most of the boys came forward and asked to be shown how this mechanism was constructed.

3. For what kinds of work are milling machines used?
   Are there other kinds of milling machines than the one used in the school shop?

Some indication that the most common uses of the milling machine, e.g., cutting flats, slots, key ways, gear teeth, were known was revealed by the answers, but only one student referred to the cutting of twist drills and reamers as a possibility. Little suggestion of any form of milling machine other than the one in the shop was obtained.

4. Name all the other machine tools you know that are not in the school shop, and state for what they are used.
   On what kind of a tool is the inside surface of a large engine cylinder cut?

To the first part of this question four made no answer; one named: "Pipe threading machine and planer"; one answered: "Different kinds of lathes, threading machines and gear cutter"; and one mentioned: "Rail mill, nail machines and rivet machines."

In answer to the second part, none named a boring mill, but five suggested a boring tool in the lathe, evidently with the idea of mounting the cylinder on the face plate.

5. What is the proper cutting speed for cast iron? For soft steel?
   How would you find the surface speed of a pulley 10 inches in diameter, in feet per minute?

None gave an approximately correct answer concerning cutting speeds.

One answered: "Sixteen feet per minute for cast iron." All the others replied in terms of fast or slow back gear.

Four attempted no answer to the second part. Two suggested a "speed counter" and one gave the formula, "multiply revolutions by the circumference."

6. What are the advantages of the individual motor drives used in the school shop? What are the disadvantages?

This was on the whole very well answered. The ideas of convenience of operation, economy of power resulting from use of current only when machine is operated, freedom of danger from pulleys and belts, and localized effect of breakdown of motor were brought out as advantages. As disadvantages, the points were made that more power was used when all tools were operating than with a single central motor, that initial cost of installation was greater, and that wear and tear on the motors was greater.

7. Why are machine tools so important and so much used in manufacturing as compared with hand work?
   What kinds of manufacturing, in which machine work is used, are found in Gary?

Of the four who attempted answers to part one, two replied: "Machine tools are faster and produced better work"; one, "They save time and labor"; and one, "They are more accurate." In regard to part two. there were four references to the steel mills, three to the bolt and screw works, and one to a garage.

FORGE SHOP

As has been previously noted, the forge shop is in a one story inner court room, well lighted and ventilated from the roof. The shop measures 26 ft. x 40 ft. The equipment comprises five power blast hand forges with down draft exhaust, a pneumatic crank hammer, one combined power punch and shear, a bench equipped with three vises and an emery wheel, besides necessary hand tools and miscellaneous equipment. Power is supplied by electric motors. The cost of the equipment is stated as $2,618.24.

The productive and repair work in this shop executed in whole or part by student workers during the year 1915–16 is reported to include the items given in Table II of the Appendix. Besides these there were a large number of jobs either of repairs or construction, some of which required considerable labor, carried through by the instructor without the help of pupils.

According to the instructor, ten is the largest number that can be accommodated in this shop when engaged in productive work. This means working two at one forge. During the time of the survey pupils from the third grade to the second year high school were found in this shop, and the sections varied from one to twenty in number. In the latter case the section consisted of four eighth grade, four seventh grade, and twelve third grade pupils. The ages of pupils ranged from eight to fifteen years.

For pupils from the third through the sixth grade the instructor has found it necessary, when such boys could not be employed at helping on very light jobs, such as drilling and riveting for flower pot stands, to utilize a series of simple exercises such as S links, staples, and rings of ¼ in. or ⅜ in. round iron, and drawing down of square and round stock.

The boys who are most interested in this shop, to judge by the numbers electing it, are those in the seventh and eighth grades and to a lesser extent in the first year high school. In the instructor's judgment the eighth grade is the earliest in which real productive work can be accomplished, and among those that come to this shop eighth and ninth grade pupils are best for this purpose.

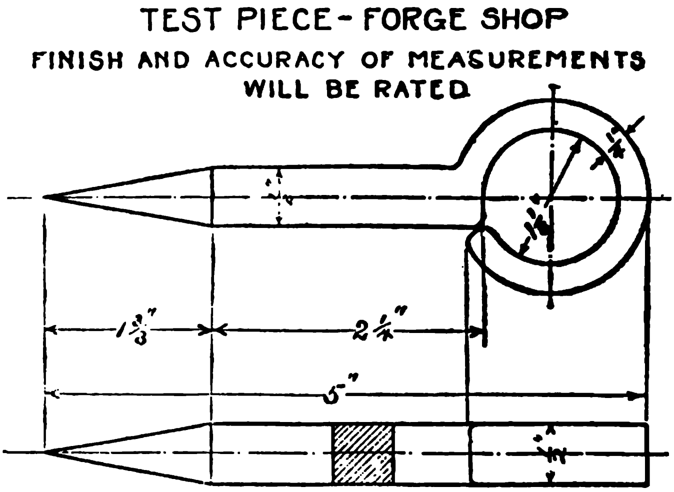
The processes dealt with by the eighth and ninth grade pupils, judged from a study of the shop production reports and statements of the instructor, are for the most part bending and drawing down, with some small amount of welding iron and very rare experiences in making steel tools.

All of the boys from these grades showed confidence in dealing with work of a kind previously met with and showed fair skill in their results. It was evident from the practical test, however, that the limits of their practical experience were soon reached and that they had not developed any marked capacity for working out a new problem by themselves.

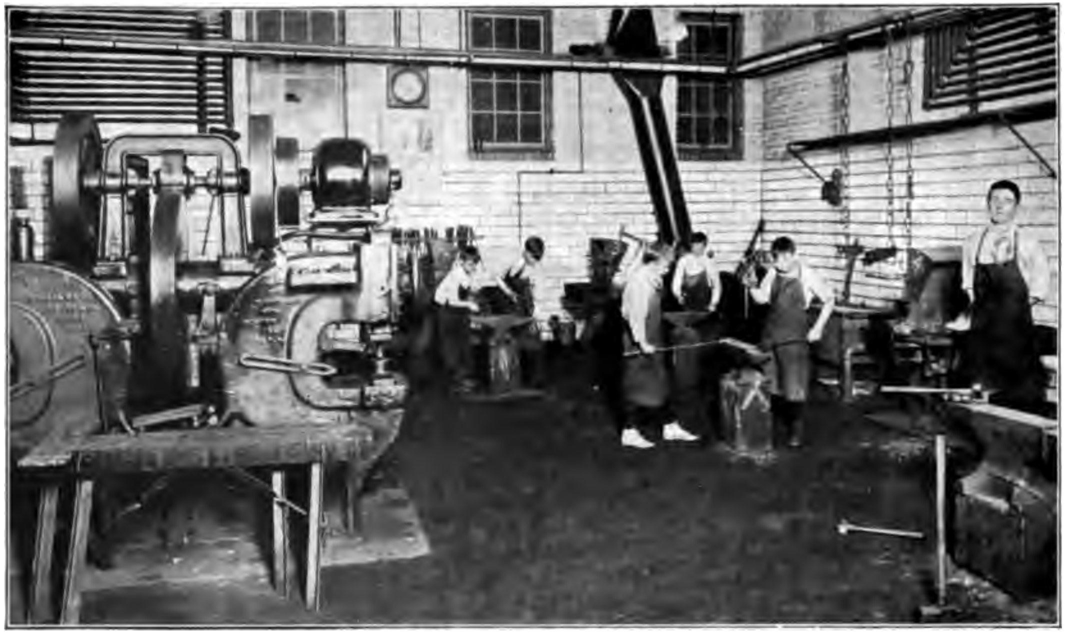
For the practical test, ten boys, varying from thirteen to fifteen years, were selected. Six of these were in the eighth grade, three in the ninth, and one in the tenth grade. Four took the test at one time and the remainder at another.

The exercise as shown below consisted in drawing down and turning an eye on a piece of ½ in. square wrought iron stock and in drawing down the other end to a point.

FIGURE 4



One of the groups made the eye first, while the other started with the point. In each case members of the group followed the lead of a specially confident and energetic leader.



Forge—Emerson School

The pieces were fairly well made and the operations on the whole correctly conducted. In all cases the thickness of the eye was below the correct size and the diameter of the eye too great. In no case was the square corner at the beginning of the eye left sharp and in only four cases was the intersection of the point with the shank sharply defined. In the majority of cases the finish left on the worked parts was good and the hole of the eye fairly smooth and regular, but in a few instances the metal was burned and the eye irregular and rough. The individual performances are described in II–B of the Appendix.

In the written test below, given to ten of the eleven boys who had taken the practical test, the results show that not much time had been given to bringing out the nature of the phenomena met with in the practice of the shop or to broadening the knowledge of the boys as to the iron working industry. This test was as follows:

1. What different kinds of materials have you worked on in the forge shop?
   How do these materials differ?
   Do they have to be worked differently? In what ways?
2. Have you ever done any upsetting, welding, or case hardening?
   What do these terms mean?
3. What happens if iron is heated too long in the forge?

What happens in the case of steel?

4. How is much of the forging of small articles done in manufacturing to-day?
5. How is wrought iron made?
   How is soft steel made?
   How is tool steel made?
   Tell what you know about the processes.
6. What kinds of iron and steel products are made in Gary?

The answers to the several questions are summarized separately.

1. (a) What different kinds of materials have you worked on in the forge shop?
   (b) How do these materials differ?
   (c) Do they have to be worked differently? In what ways?

The answers to this question do not indicate very definite ideas as to the materials used, at least as far as putting such ideas into written words is concerned. Oral questions brought out the fact that only a very few boys had worked in tool steel or knew anything about its properties.

(a) Seven answered that they had worked in iron and steel; one specified iron and tool steel; and one, iron, soft steel, and tool steel.

(b) Five answered: "Steel is harder than iron," and two, "It can be tempered."

(c) Three simply wrote, "Yes" and three, "No." One answered: "Steel should be worked hotter than iron," and three, correctly, "Iron can be worked at a higher heat than steel."

2. (a) Have you ever done any upsetting, welding, or case hardening?
   (b) What do these terms mean?

The answers indicated an acquaintance with simple methods of upsetting and welding, but only in a few instances with case hardening, which was at times confounded with water hardening of tool steel.

(a) Five had performed all three operations; two, upsetting and welding; one, upsetting and case hardening; and one had done none of these things.

(b) Five answered in effect that upsetting is to knock back the end of the iron while hot and to thicken or bulge it out, and one that it is to knock the end flat. Eight answered: "Welding is to join two pieces of iron by heating very hot and hammering them together."

Two described case hardening as heating steel with a coating of potash and then cooling in water. Three described the regular hardening of carbon tool steel by heating and cooling in water.

3. (a) What happens if iron is heated too long in the forge?
   (b) What happens in the case of tool steel?

The replies indicated little knowledge as to the differing effect of high heat on the two metals.

(a) Nine replied: "Iron burns if heated too long in forge," and one, "It melts."

(b) Six answered: "Steel also burns under these conditions," and one, "It melts." Two came nearer to the actual fact by saying: "The end drops off the piece if heated too long."

4. How is much of the forging of small articles done in manufacturing to-day?

The answers gave hardly an indication that the pupils were aware of the commercial methods of forging, such as drop forging with dies, steam hammers, or presses, although oral questions brought out the fact that all were familiar through actual practice with the power hammer in the shop and understood that similar hammers were used in larger establishments.

Five answered in general terms "by machinery"; two, "by manufacture"; one, "by hand"; and another, "by drop forge."

5. How is wrought iron made?
How is soft steel made?
How is tool steel made?
Tell what you know about the processes.

No pupil betrayed by answers either to this question or to oral questions any conception even of the most elementary character as to how wrought iron, soft steel, or tool steel is made.

Eight gave no answers.

One replied: "Wrought iron is made by melting and pouring the iron over, soft steel is made by heating the steel and letting it cool without dropping in water, and tool steel is the hard steel that has been dipped in water." Another answered: "Wrought iron is made by melting iron ore in the furnace in the open hearth."

6. What kinds of iron and steel products are made in Gary?

In answer to this question the replies seemed to indicate that no reference to this subject had been made in class, and that the very few ideas expressed had been gained from hearsay outside of school.

Three gave no answer. Two replied: "Soft steel and tool steel' ; five, "Steel rails"; one, "Structural steel"; one, "Billets"; one, "Bar steel"; and one, "Screws and nuts."

FOUNDRY

The foundry, with the forge shop, is located in an inner court. It is 26 ft. x 40 ft. and is well lighted and ventilated from the roof. The shop has a molding sand floor upon which all work is carried on and is equipped with a 22 inch cupola with charging gallery affording storage for coke and iron, a crucible brass furnace, gas furnace for melting lead or other easily fusible metals, core oven, scales, core bench, electric motor and fan for cupola blast, about a score of small flasks and several of larger sizes, and kits of molders' tools.

The productive and repair work in this shop executed in whole or part by student workers during the year 1915–16 is reported to include the items given in Table III of the Appendix. In addition to these items, the records show numerous castings gotten out by the instructor without participation by pupils, in particular, grate bars for the boilers every few weeks.

The practice in the foundry is to cast from the cupola two or three times a month. On the larger and more difficult work the instructor assists and finishes the mold when necessary. The work of the smaller boys is commonly cast in lead.

The capacity of the shop seems to be about 18 or 20. During the winter term the different sections varied in size from 4 to 15; and there were three periods in which there were no pupils in the shop. During the spring term the groups of boys ranged from 10 to 16 in number; there was one class of girls numbering 7, and one vacant period. With one exception the grades of pupils varied from the third to the eighth and the ages from eight to fourteen years. One case which appeared to be exceptional was a second year high school boy, aged fifteen.

In the instructor's opinion, the boys from the third

Foundry--Emerson School

grade were generally too small and lacking in physical strength for this work, those from the fourth and fifth grades commonly too young for practical production, and those from the sixth to the eighth grades best adapted for commercial work. This opinion seemed to be fairly well sustained by observation and by the results of the practical tests, although in the latter case the twelve year old boys from the fifth grade produced as good work as those from the sixth grade, indicating that the age factor is, perhaps, of more significance in this connection than the school grade.

In the instructor's opinion six to eight are as many as can be efficiently handled at one time when dealing with commercial work.

A practical test was given near the end of the spring term to 21 boys varying from the fifth to the eighth grade and from ten to fifteen years in age. There were 5 boys from the fifth grade, 5 from the sixth, 6 from the seventh, and 5 from the eighth. These boys were all supposed to have had at least two and a half months of experience in the foundry.

To each of the boys from the fifth and sixth grades were given two patterns as shown in Figure 5, one of a half box for a connecting rod end, and one of a machine wrench.

To each of the seventh and eighth grade boys was given one of the patterns requiring a core shown in Figure 6. Some of these patterns were halved and some were solid, requiring a waste bed in the cope. In all cases the molds when finished were cast in lead.

Figure 5

Patterns Used in Foundry Test

(fifth and sixth grade boys)

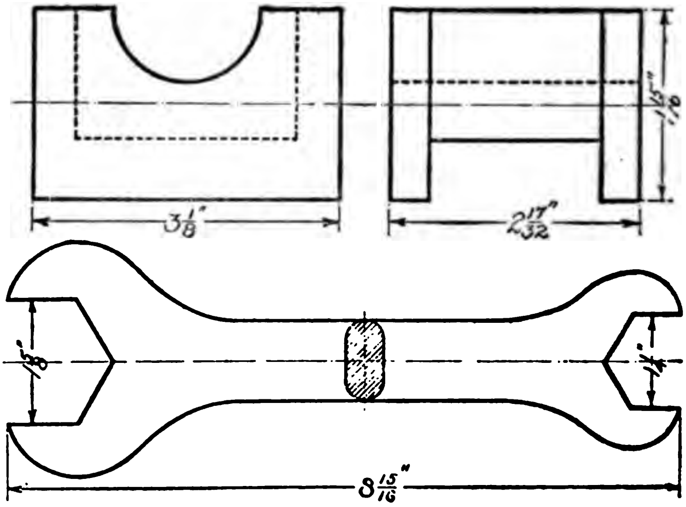
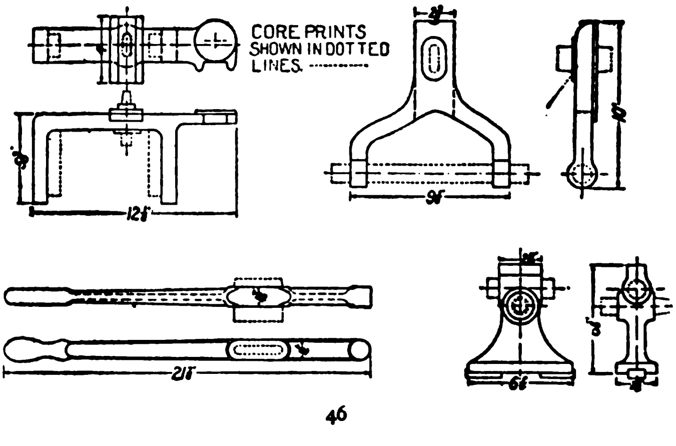


Figure 6

Patterns Used in Foundry Test

(seventh and eighth grade boys)



On the whole, the work was very well done. The boys went to their tasks with readiness and confidence, asking but few questions. They carried through the different steps in a businesslike way and lost little time through mistakes or hesitation.

The work of many of the fifth and sixth grade boys with their simpler pieces was practically as good as that of the older boys with the more difficult patterns. The results, which are set forth in detail in II–C of the Appendix, are summarized below:

TABLE V

RESULTS OF PRACTICAL FOUNDRY TEST

FIFTH GRADE		SIXTH GRADE	
AGE	QUALITY	AGE	QUALITY
10	Poor	10	Failure
11	Good	11	Fair
11	Poor	11	Good
12	Good	11	Good
12	Good	14[1]	Poor

SEVENTH GRADE		EIGHTH GRADE	
AGE	QUALITY	AGE	QUALITY
11	Good	12	Very good
12	Rather poor	12	Very good
13	Spoiled (no fault of pupil)	13	Good
14	Good	13	Good
14	Failure	14	Very good
15	Good		

The work in foundry molding differs in several aspects from that of the other shops. With simple patterns, such as used in this shop, the processes involved are few in number and easily grasped. Some degree of physical strength is required to turn the loaded flasks, but a little practice in the case of normal eleven or twelve year old boys soon develops sufficient skill to accomplish successful practical results with the usual small patterns. If the range of patterns is very limited, as it is in this foundry, the boys of eleven and twelve soon come to produce almost as good results as boys of thirteen and fourteen. On the other hand, small flask work with simple patterns presents very little variety and but limited range of ideas. There is much repetition without proportionate progress. These facts limit the educational value of the work and make it doubtful whether the return to the boy justifies the devotion of ten hours a week for a term of thirteen weeks to this shop. It is probably the boys' reaction against the monotony of molding that leads the instructor to state that for most boys a period of one hour would be better than two. In any event, it would seem clear that the expenditure of any large amount of time upon foundry work can only be justified educationally provided considerable attention is given to bringing out a background of ideas and knowledge drawn from this and related industries.

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[1] Backward pupil.

That some, although limited, attempts had been made in this direction is evident from answers to oral questions and from the results of a written examination given to the seventh and eighth grade boys who took the practical tests. The written test was as follows:

1. Of what two materials must a good molding sand be composed?
   Why cannot pure sand be used?

Why cannot the other material be used alone?

2. Why is coke used in a cupola instead of coal?
   Why is a blast used?
   At what temperature does cast iron melt?
3. From what is pig iron made?
   Tell what you know about the process.
4. What metals are made from pig iron?
5. How are large circular castings, like pulleys, sometimes made?
6. What kinds of iron and steel products are made in Gary?

The answers are summarized below:

1. (a) Of what two materials must a good molding sand be composed?

Three pupils specified pure sand or Gary sand and clay.

(b) Why cannot pure sand be used?

Seven answered correctly: "The mold would not hold together."

(c) Why cannot the other material be used alone?

Five gave answers that seemed to indicate the right idea, viz., that if the other or "sticky" material were used, the mold would be too solid and would not allow the gas to escape.

2. (a) Why is coke used in a cupola instead of coal?

Nine stated correctly: "Coke is used because it gives a hotter fire and melts the charge more quickly."

(b) Why is a blast used?

Ten replied: "The blast produces a hotter fire."

(c) At what temperature does cast iron melt?

One gave 60 to 70 degrees; one, 1,275 degrees; six others gave figures approximately correct, varying from 2,000 degrees to 2,800 degrees.

3. (a) From what is pig iron made?

Only two mentioned iron ore.

(b) Tell what you know about the process.

Only one made any reference to the ore being changed by heat in a blast furnace to pig iron, although these boys are supposed to have been in science classes of one kind and another ever since the fourth grade, and ideas of such changes should not be unfamiliar to them by the time they reach the seventh and eighth grades.

4. What metals are made from pig iron?

Two mentioned steel, one cast iron, four steel and cast iron, one steel and iron.

5. How are large circular castings, like pulleys, sometimes made?

This question is perhaps rather difficult for boys in the elementary school. It was given in order to ascertain whether any effort had been made to indicate processes of molding other than the simple ones dealt with in the school shop. The answers, together with the results of oral questions, failed to show that any such attempts had been made.

6. What kinds of iron and steel products are made in Gary?

Similar questions were given also in the forge shop and machine shop examinations; the results obtained in all cases indicated that in none of these metal working shops had any attention apparently been paid to illustration, study, or even enumeration of the products of the great mills that are the reason for the city's existence. Eight boys specified steel rails, but beyond this point the answers were either vague or wanting.

PRINTING SHOP

The printing shop in the Emerson school occupies a room similar to the machine shop in the front of the building. It is 21 ft. x 50 ft., and lighted by windows on one of the long sides. The equipment consists of two job presses, one 12 in. x 18 in., and one 10 in. x 15 in.; wire stitcher, lead cutter, imposing stone and frame, metal proof press, numbering machine, multiple power punch, vibrating roller, cutting machine, stock case, case stands, cut cabinet, type and cuts, miscellaneous tools and equipment. The presses, wire stitcher, and power punch are supplied with individual motors.

The equipment represents an expenditure of $2,857.79.

The productive work of this shop for the year 1915–16 is reported to have included the items given in Table IV of the Appendix.

On account of the change in instructors noted below, it was impossible to ascertain just which items were executed by the pupils, although it was stated by the new instructor that there were very few jobs in the printing shop in which the pupils did not perform the bulk of the work.

The capacity of this shop seems to be about 12. In the winter term the numbers in the various sections varied from 1 to 11 and totaled 22 boys and 11 girls, ranging from the third grade to the second year of the high school. During the period of the survey the shop did not appear to full advantage, as the former instructor had left shortly before and the position was being filled by a temporary teacher.

In the opinion of the instructor, boys of the third grade are not sufficiently developed to profit by the work. This agrees with the views of the former instructor, who was interviewed on an earlier visit in January and who stated that the third grade boys soon lost interest in the work assigned to them and did not wish to remain in the shop for thirteen weeks. Both the former and the present instructor felt that the pupils coming from the eighth and ninth grades were best fitted for the work of this shop and most satisfactory for productive work.

Practical and written tests were also given in this shop, the results of which will be described hereafter in connection with the same tests given in the Froebel school.

Print Shop—Emerson School

III. SHOPS AND TESTS IN FROEBEL SCHOOL

PRINTING SHOP

THE printing shop at the Froebel school occupies a room on the ground floor and is 23 ft. x 31 ft. It is well lighted by windows on one of the long sides. The equipment consists of two job presses, one 12 in. x 18 in., and one 10 in. x 15 in.; lead cutter, imposing stone and table, lever press, California job case, double case stands, cutter, stock cabinet and benches, miscellaneous type, miscellaneous tools and equipment. The presses are supplied with individual electrical motors.

The cost of the equipment is stated as $1,352.70.

The productive work of this shop executed in whole or in part by student workers during the year 1915–16 is reported to include the items given in Table V of the Appendix.

The shop capacity seems to be about 12. During the latter part of March the numbers in the various sections varied from 6 to 12 and totaled 36, all boys, ranging from the fourth grade to the second year of the high school and from ten to sixteen years of age. In the opinion of the instructor, pupils of the third grade are too young to profit by the work, but from the fourth grade up they can benefit. The sixth grade is the lowest to which he usually gives any commercial work and for this purpose he finds pupils from the eighth and ninth grades best fitted.

As stated above, the same practical and written tests were used in the printing shops of both the Emerson and Froebel schools. The practical test was given to ninth grade pupils at the Emerson school on March 16th. It was intended that this test should be taken by the 14 ninth grade pupils on the shop register, but, owing to some school function of which the instructor had not been informed, only four pupils appeared in class and performed the work. It should perhaps be noted that similar unexpected absences from the assigned shop classes were frequently met with during the progress of the survey.

The four pupils consisted of one boy fourteen years of age, two girls of fourteen years, and one girl of sixteen years. Directions for the test were given to each pupil on a typewritten sheet as shown below:

PRINTING TEST

Directions—The copy below is to be printed on a card 3½ in. x 5½ in. You are to use your own judgment as to type, margins, and arrangement.

Copy

Public Schools
Gary, Indiana
——— 191—

Mr. ————

I regret to inform you that ———— came late to school this ————. This is the ——— time he has been tardy.

Will you coöperate with the school in training your child to be punctual.

The school hours for ——— are as follows: ——a. m. to —— m; and —— p. m. to —— p. m.

Please sign and return.

————————
Principal

————————
Parent's Signature.

Of the four workers, the boy had been in the printing shop four terms, the girls were at the close of a single term. None seemed to have any acquaintance with the point system except the boy, and even his ideas upon the subject were vague. They all knew the type case and use of stick. The boy set his stick after making a sketch and deciding on his margins. The girls assumed a length of line but did not check this by reference to width of card. One girl set her stick in inches and two girls in picas. The boy was the only one who could take his material out of the stick and tie it up for proof. The girls needed assistance in doing this.

After the material was tied up in the galley, proofs were taken. The resulting proofs, which are analyzed in some detail in II–D of the Appendix, were on the whole fairly good. The weakest showing, as was to be expected, was in the justification and in the judgment displayed in the arrangement of margins and in the selection of type and display of heading.

Exactly the same test was given to ten boys from the ninth grade and two boys from the tenth grade at the Froebel school on March 21st. One boy was twelve, two, thirteen, five, fourteen, three, fifteen, and one, sixteen years of age.

Three of these pupils had been in the shop only seven weeks; two had had fourteen weeks; four, two terms of thirteen weeks; one, three terms; and two, four terms.

The pupils in the Froebel school showed great readiness and much intelligence in handling the test. Their knowledge of the point system seemed to be sufficient to enable them to set up work with judgment. There was only one boy who did not allow for his margins in terms of picas. All of the others when questioned orally told readily how many picas of margin they had allowed. They all tied up their matter in the galley and took their own proofs.

The proofs on the whole were very good. The weakest points were in justification, which in three cases was quite defective, and in length and position of leads. Judgment as to margins, selection of type, and display of heading were in most cases creditable.

An identical written test was given to nine pupils at the Emerson school and to eight at the Froebel. The nine Emerson pupils included the three girls who had taken the practical test and three boys and three other girls who were in the printing shop during the winter term. These were all from the ninth grade and each fourteen years old. The eight Froebel pupils had all taken the practical test. They included six boys from the ninth grade and two boys from the tenth grade.

The test is given below:

1. How many points to an inch?
   How many picas to an inch?
   How many points to a pica?
   What are ems?
2. What is a lead?
   What is a slug?
   What is a rule?
   What is furniture?
   What are leaders?
   What is a chase?
   What is a form?
   What is a stone?
3. Draw a simple outline sketch showing how you would place the type, furniture, and quoins in a chase for locking up.
4. How is type generally set in large newspaper offices?

5. How does the newspaper press differ from the press in the school shop? Why is this kind of press better for newspaper work?
6. In printing a book, is each page printed separately? If not, how are the pages printed?

Some of the questions in the paper may well be criticized as not fully appropriate to a written examination. It may well be said that definitions in writing, as required by question 2, are not a proper criterion of the pupil's ability to use the articles mentioned and that a more just method of estimating the pupil's knowledge would be through oral questions in the shop with the articles at hand. Commonly such a criticism would be justified, but as a matter of fact oral questions were very extensively used and the results were so varied, especially as between the two schools, that written questions were used to obtain a record upon which to base comparisons. Again, question 3 asks for information that could apparently more properly be obtained through observing in the shop the operation described. This is in part true, but it was impracticable to arrange to have all pupils go through this operation, and as the pupil's comprehension of salient features of correct locking up could very readily be shown by a sketch it was felt appropriate to ask this particular question.

The results of the examination were widely different in the two schools. Of the eight papers from the Froebel pupils one was marked perfect and five others were rated over 90 per cent. correct.

On the other hand, the nine Emerson pupils showed very little knowledge of the matters in question and often very little interest in them. Their answers are analyzed below:

Question 1 was answered correctly by only one pupil.

Question 2 was correct in full in four cases and correct in about half of the items in three others.

Question 3. Only one sketch was made that was intelligible.

Question 4. Correct in three cases.

Question 5. Significant difference given in only one case.

Question 6. Correct suggestion given in only one case.

The two sets of papers show rather strikingly the difference that may be made of the intellectual and informational side of school shop practice. As a matter of fact, the two shops reflected the same contrast in their atmosphere and spirit; in one the pupils were interested and energetically busy, in the other they appeared indifferent and dawdled over their work.

WOODWORKING SHOP

The woodworking shop at the Froebel school is located in an inside one story court room, 24 ft. x 50 ft. It is well lighted and ventilated from the roof. It is furnished at one end with an equipment of mill tools, each supplied with individual electric motor, including band saw, circular saw, jointer, planer, mortising machine, and swing cutting off saw. In addition there are two long benches and miscellaneous tools and equipment. The total cost of this installation is reported as $1,519.00.

The other half of the room contains thirteen individual woodworking benches and one bench 12 feet long, each supplied with vises and an equipment of small tools, three speed lathes furnished with electric motors, a tool grinder, cupboards and miscellaneous fixtures, costing $702.15. There is also a lumber storage room 20 ft. x 20 ft.

As before noted, it was found impracticable to use the mill equipment with boys under sixteen years of age on account of the state law relating to the operation of machinery by minors. As the number of boys who had reached this age at the Froebel school was very small, the use of this part of the equipment as a school shop was discontinued in April, 1916, and shop work was confined to the bench equipment with younger boys.

During the time that the cabinet making shop was in operation a considerable amount of installation and repair work was performed in different buildings, but, as the instructor had left the school system before the work records were in the hands of the survey staff, it was impossible to ascertain to what extent the pupils had participated in the various tasks.

A large portion of the jobs enumerated in the shop reports are listed as "repairs to building," "repairs to equipment," "repairs in shop," but their exact nature is

Woodworking Shop—Froebel School

not indicated. In addition to these occur the following items: Hanging fire extinguishers, window brackets, towel boxes, spring board for swimming tank, display panel, building blocks, Montessori sets, bases for lockers, encasing stairway, and, most important in point of charge value, thirty teachers' desks.

The cabinet making instructor was engaged alone during August, 1915, in work which included, among other items, a sink at the Jefferson school, a steel ceiling at Jefferson school, and the installation of a new plumbing shop at Froebel school.

The boys in the bench shop at the time of the survey ranged from the fourth grade to the eighth and from ten to fifteen years of age. The classes were somewhat larger than those met with in the other shops, numbering from 12 to 17, and totaling 86 individuals.

The work in this shop was essentially on a manual training basis, that is, although effort was being made to turn the product as far as possible toward such purposes as drawing models and apparatus for nature study, a large portion of the projects represented the boys' personal and play interests, such as kites, windmills, bows and bats, and things for the home, such as flytraps. This situation, into which the school administrators have apparently been forced as a result of experience, affords an interesting sidelight upon the maintenance shop as a uniform policy of the elementary school.

The spirit of the work and the quality of the teaching in this shop were very good. There was always a deal of freedom and considerable noise, but it was not freedom that had degenerated into license.

A practical test was given to seven boys of the seventh and one from the eighth grade on March 17th. Of the five boys who completed the test (all from the seventh grade), one was twelve years, three were thirteen, and one fifteen years of age. Each of these pupils had had at least one full term of woodworking and three were in their second term.

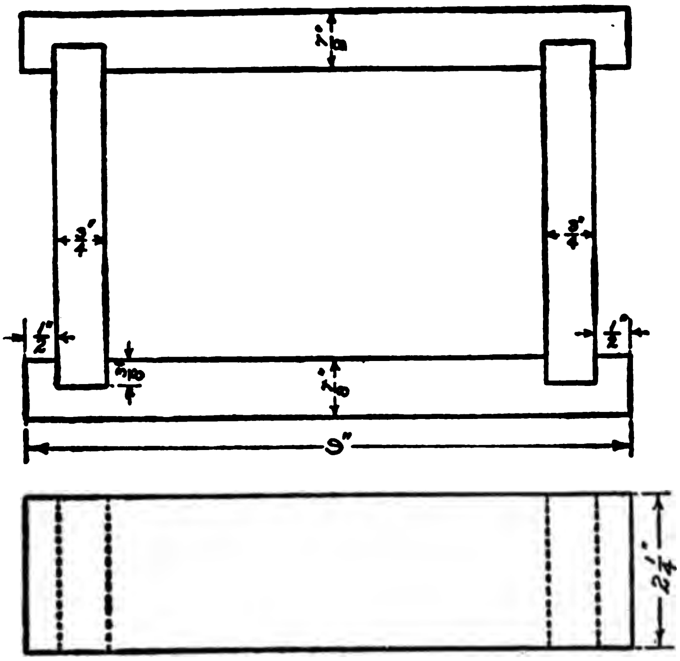
A blue print, as shown in Figure 7, together with a piece of whitewood 30 in. x 2½ in. x ⅞ in., machine dressed on the two faces and jointed on one edge, was given to each pupil. As will be seen, the drawing requires that this stock shall be planed down on one edge to 2¼ in. in width, and the two short pieces reduced to ¾ in. in thickness.

The five boys who completed the test turned out substantial pieces that would meet ordinary practical requirements. Their confidence in approaching the work, their manner of carrying through the various operations and their workmanship would compare favorably with that of the average run of boys from the seventh or eighth grades who had had a year's experience in a conventional manual training shop.

The test, which is described in detail in II–E of the Appendix, showed ability on the part of each boy to read the drawing and some facility and familiarity in the use of try square, cross cut saw, plane, and chisel. None of the boys used a marking gauge to lay off the width or thickness of pieces to be planed.

FIGURE 7

TEST PIECE-WOOD WORKING
ACCURACY OF FITS AND MEASUREMENTS
WILL BE RATED.



No written test was given to the wood shop pupils.

SHEET METAL SHOP

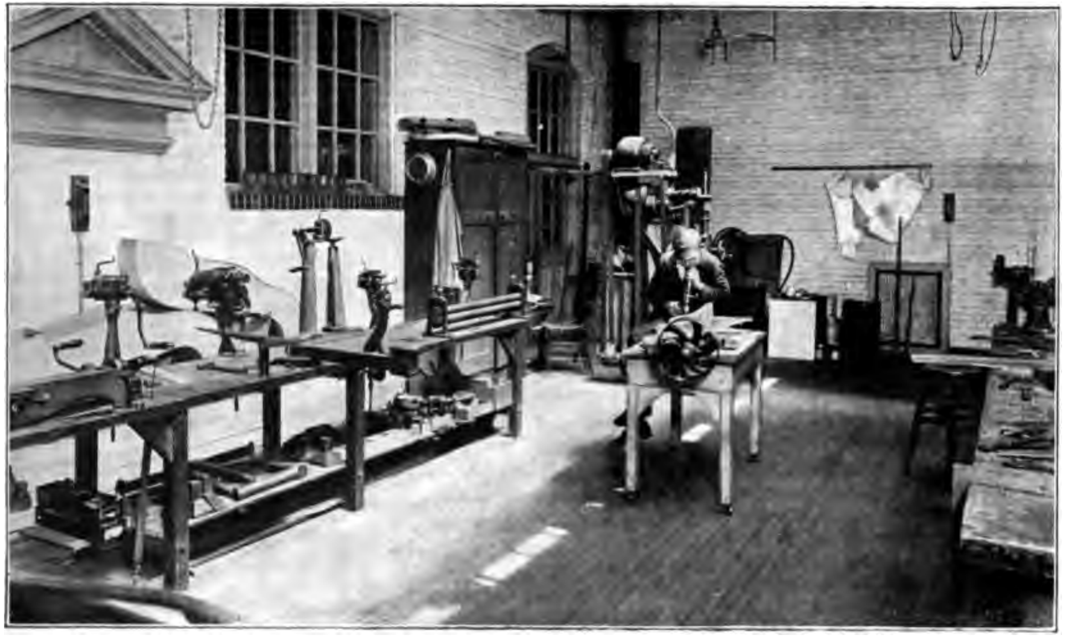
The tinsmithing or sheet metal shop, like that for woodworking, is 24 ft. x 50 ft. and is situated in the court, with overhead lighting. It is equipped with the following tools: 36 inch heavy squaring shear, No. 4 tinner's bench shear, 36 inch adjustable bar folder, can top folder, 36 in. x 2 in. pipe forming rolls, 30 inch grooving machine, No. 3 steel cornice brake, No. 2 beading machine, small burring machine, large burring machine, small turner, large turner, wiring machine, setting-down machine, cornice maker's crimper, 2 inch double seamer, and an assortment of bench stakes and mandrels.

The productive and repair work in this shop executed in whole or part by student workers during the year 1915–16 is reported to include the items given in Table VI of the Appendix. The work reported as performed by the instructor during the school year without the assistance of pupils is comparatively small.

The sheet metal instructor was employed during August upon installation and repair jobs about the buildings.

The capacity of the shop is about 15. During the spring term the different sections varied in size from 3 to 15 pupils, coming from the fourth to the ninth grades and varying in age from nine to fifteen years. During the first week of the survey there were no pupils in the sheet metal shop, as the instructor was engaged in some piece of repair or installation work in another part of the building.

The instructor stated that he could not accomplish much with boys below the sixth grade, but from that grade up the boys are old enough to handle the simpler processes and obtain benefit from the shop experience.



Sheet Metal Shop—Froebel School

He feels that seventh and eighth grade pupils are best fitted for the work and considers that five boys represent the limit that can be satisfactorily handled when engaged in productive work. He explained that by this last statement he meant that when the class is larger he finds it impossible to do anything but turn out work, and has no opportunity to give what he called "proper instruction." With the boys that come to this shop, the instructor almost invariably lays out the work himself. If there is a quantity of one article required, this is done by making a template. He considers that boys in the elementary school grades are too young for this laying out work and that the first year high school is the earliest in which this feature can be introduced. He points out that the boys not only need experience in pattern drawing, but experience in actual construction to permit them to judge properly the allowances for laps, seams and folds. He has tried simple flared work with ninth grade boys, e.g., funnels and cups, with moderate success. The boys accomplished the geometrical layout fairly well, but were at a loss as to allowances for the seams. Boys from the sixth grade are usually put to work on cups, boxes, and desk trays in tin. Later heavier galvanized iron work is introduced, and pails, trays, window boxes, and aquariums were among the articles made during the period of the survey.

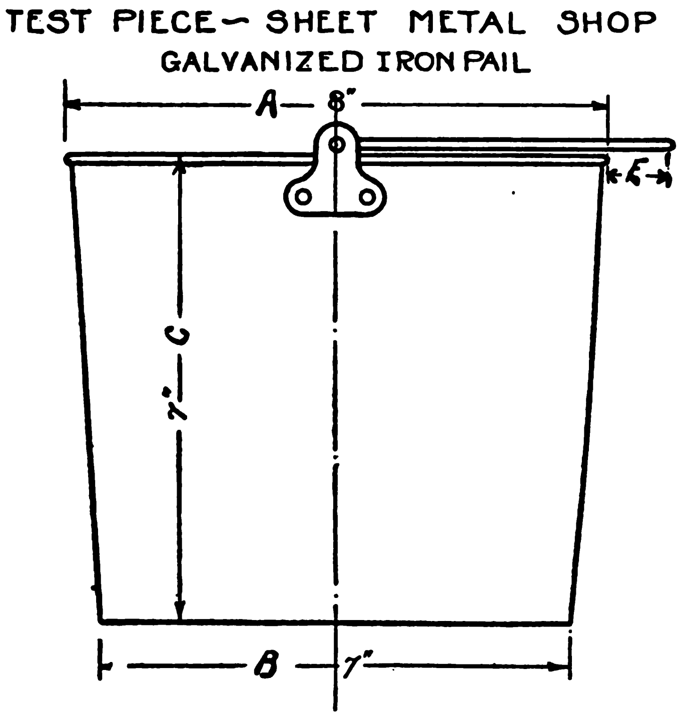
The spirit and character of the work in this shop were uniformly excellent. The pupils were always found busily at work and the instructor almost invariably engaged not merely in giving directions, but in teaching in the truest sense. His method of drawing out ideas and stimulating thought and experiment on the part of his pupils by well chosen questions was altogether admirable. Even in this shop, however, the written test seemed to indicate that not enough time has been given to organized instruction regarding materials and the rationale of methods.

A practical test consisting in making a galvanized iron pail, as shown on the next page, was given to seven boys on May 2d, 3d, and 4th. Three of these were in the seventh grade and four in the eighth, four were twelve years old and three were fourteen. All had had one or two terms in the shop, except one boy who had had only five weeks. Two did not finish their piece because of absence, and one, after spoiling his first attempt, did not complete his second.

The test is described in detail in II–F of the Appendix. At the beginning the instructor set the folder and machines for burring and turning in proper position and gave out a pattern for sides of pail. He also noted necessary dimensions. The boys worked in an orderly way with no confusion. Each boy evidently understood the proper sequence of operations and went ahead without hesitation.

Four of the boys completed their pails, as will be seen by the detailed description, with small variations from the correct dimensions, and, with the exception of one who had never made a pail before, with creditable workmanship.

FIGURE 8



The locked and grooved vertical seam at the side and the double turned seam at the bottom were substantially and solidly made in three cases, although not always straight and even in appearance. The wire edges at the top were strong and firm but in no instance was the wire fully covered. The soldering of the seams in the same three cases was smooth and even, and in the fourth, rough and imperfect.

The written test was given to six of the boys who started in the practical test, one boy from the eighth grade being absent, and to one additional boy, sixteen years old, from the ninth grade. The test was as follows:

1. Tell the difference between sheet tin and galvanized iron.
   How is each made?
2. Of what is solder made?
   Of what is the soldering iron made?
   Why is this metal used?
3. What do you apply to tin before soldering?
   Why do you use it?
   What do you apply to galvanized iron before soldering?
   Why do you use it?
4. What different kinds of seams are used in sheet metal work?
5. What kinds of jobs does the sheet metal worker do while employed in his trade?
6. What kinds of sheet metal are manufactured in Gary?

The answers are summarized below:

1. Tell the difference between sheet tin and galvanized iron.
   How is each made?

Only three boys stated that sheet tin is sheet iron or steel covered with tin; and galvanized iron, sheet iron or steel covered with zinc. One boy reported that the tin and zinc are melted and the sheet iron dipped into the liquid metal.

2. Of what is solder made? Of what is the soldering iron made? Why is this metal used?

Five answered: "Solder is made of tin and lead," and the same number, "The soldering iron is made of copper." One wrote that copper was used because solder "sticks to it"; one, that copper "gets hot quicker," and two, that "copper can be heated to a great heat before melting."

3. What do you apply to tin before soldering? Why do you use it? What do you apply to galvanized iron before soldering? Why do you use it?

Six answered: "Rosin is applied to tin before soldering." All stated this was to make the solder stick. None suggested that it was to prevent the tin from oxidizing when heated. Five held that an acid, and two, a liquid, is applied to galvanized iron before soldering. Three maintained that this was to make solder stick; four had a fuller comprehension explaining that it was to clean the surface.

4. What different kinds of seams are used in sheet metal work?

None of the group appeared to know the names of the seams, such as locked and grooved, double turned.

5. What kinds of jobs does the sheet metal worker do while employed in his trade?

Three boys gave answers suggesting other work than pails and small articles, such as stove pipes, ventilators, rain pipes, door casings.

6. What kinds of sheet metal are manufactured in Gary?

Four mentioned sheet tin and four galvanized iron.

The replies of the boys from the eighth grade were noticeably more intelligent and well informed than from the seventh grade.

PLUMBING SHOP

The plumbing shop occupies a room 21 ft. x 30 ft., well lighted by windows on one of the long sides. It is the only shop equipped with a blackboard, its presence here being due to previous use of the room for regular class purposes. The surface of the board was for the most part covered during the period of the survey by a storage cabinet.

The equipment of the plumbing shop includes a plumber's bench and three vises, stock rack, and miscellaneous tools and supplies. The cost of equipment is stated as $190.85.

Plumbing Shop—Froebel School

The productive and repair work in this shop executed in whole or part by student workers during the year 1915–16 is reported to include the items given in Table VII of the Appendix.

During the summer months the plumbing instructor was employed on various repair and installation jobs in the different school buildings, and during the course of the school year performed repair jobs in seven schools other than the Froebel. These jobs occurred at the rate of one to three a month.

The working capacity of the shop, if all pupils are to be employed at pipe cutting and fitting, seems to be hardly above six. During the survey the numbers in the shop at different periods ranged from two to nine pupils from the fourth to the ninth grade, and from nine to fifteen years in age.

The great variation in age and the frequent presence of over-age pupils in the Froebel school were particularly apparent in the classes of the plumbing shop during the spring term. Among the seven fifth grade pupils there was one boy fourteen years and one fifteen years old.

In the instructor's opinion, boys below twelve years of age are not fitted as a rule for installation work, and five is the largest number that can be handled effectively on such work. In this shop the younger boys present a particular problem because of the expensive material involved, which they can be trusted to handle only to a limited degree.

The plumbing instructor is expected to attend to repairs and installations in all the school buildings. He states that he is away from the shop on some kind of work on an average of two hours out of seven, and that he generally takes one or two boys with him, leaving the others in the shop cutting nipples or doing other work. On occasion he takes the whole group along to observe, but in such cases, he reports that those who cannot be actually engaged are liable to lose interest and "to fool and chase around."

As the plumbing lines and connections in the Froebel school consist almost entirely of galvanized iron pipe, the practical work in the shop is limited almost solely to the manipulation of this material. Cutting, threading, and fitting of such pipe, generally ¾ in. in size, together with clearing stoppages in sinks and closets, constitute the common range of manual operations.

It is evident that this pipe cutting and threading offers extremely few operations or ideas. The intellectual opportunities of this shop clearly must be found in the field of plumbing practice as governed by physical science. The laws of water pressure, theory of traps, vent pipes, kitchen boiler and water-back connections, the operation of flushing tanks and heating systems, and the reasons underlying the board of health rules for plumbing installation, afford rich material for educational purposes.

Apparently very little has been done in this direction. The instructor states that he has attempted to bring out some of these ideas when working on a job with his pupils and that he has explained the construction of a hot water boiler in the shop, but that, as a general thing, he has not time to devote to these matters. He always has more demands than he can meet and frequent emergency calls take him from the shop, obliging him to leave his class.

This shop illustrates the limitations of the maintenance plan from the educational standpoint perhaps more strikingly than any other. To some extent, as the above account shows, this is inevitable, but it is also partly due to the instructor who, though thoroughly well intentioned and desirous of helping the boys to the fullest extent, is rather lacking in the energy necessary to carry through instruction of the needed breadth in the face of the obstacles that confront him. This may explain, also, the rather free and easy atmosphere of the plumbing shop, where one is quite as likely to find a boy idling as working.

On May 2d a practical test was given to nine boys from the seventh, eighth, and ninth grades, each of whom had had at least one full term of work in the plumbing shop. Two of these boys were from the seventh, two from the eighth, and five from the ninth grade. One was twelve years of age, six were fourteen, one was fifteen and one sixteen years of age.

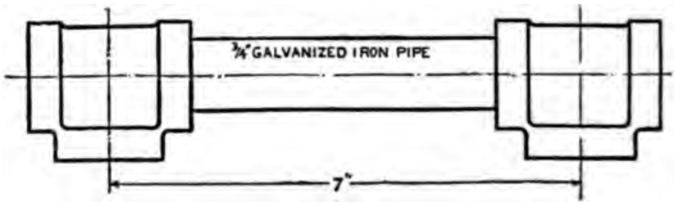
The drawing shown on the following page together with accompanying notes was placed on the blackboard. Five of the boys took the test in the morning and four in the afternoon.

Each one selected a piece of pipe from the stock rack and proceeded to cut it off with the pipe cutting tool. They used the stock and dies to cut a thread on each end and in most cases reamed the ends properly.

The workmanship, as far as the threading and fitting of the pipe into the two tees is concerned, was such as to produce strong and tight joints that would have served for ordinary practical purposes. The only notable failure to achieve a correct result was in the interpretation of the drawing, six of the boys reading the distance between the centers of the tees as referring to the length of the pipe. In consequence, the finished pieces in these cases measured 8$\frac{3}{4}$ in. or more between centers instead of 7 in. That this was the result of carelessness seemed apparent from the fact that, when these boys were asked at the end of the test whether they fully understood the drawing, they all answered "yes," and to further ques-

FIGURE 9

TEST PIECE—PLUMBING SHOP



PIPE TO BE CUT TO PROPER LENGTHS AND FITTED TO TEES
RATED FOR ACCURACY OF DIMENSIONS AND QUALITY OF FIT

tions as to what the 7 in. dimension meant, each answered "to the center of the tees."

The time element bears a rather interesting relation to the interpretation of the drawing. The first six boys who failed to read the dimension of length correctly finished their piece in periods varying from 15 to 34 minutes; the last three whose pieces were correct in length consumed, respectively, 43, 46, and 54 minutes. The test is described in detail in II–G of the Appendix.

Seven of the boys who had taken the practical test were given the following written examination on May 4th:

1. What different kinds of pipe are used in plumbing?
   For what purposes is each used?
2. Why is lead pipe less used than formerly?
   What are the advantages and disadvantages of lead pipe?
3. Why are traps used?
   Name the different kinds of traps.
   Why are they vented?
   Draw a section of one form of kitchen sink trap.
4. Draw a diagram of a hot water system, showing connections to the kitchen stove and hot water tank. Show all piping and describe how the water circulates.

The answers are summarized below:

1. What different kinds of pipe are used in plumbing?
   For what purposes is each used?

Four answered this question very well, one giving the names of five kinds of pipe—lead, galvanized iron, nickel plated brass, cast iron soil, and tile pipe; three mentioned four of these. These four boys indicated the uses of the different kinds of pipe with fair correctness.

2. Why is lead pipe less used than formerly?
   What are the advantages and disadvantages of lead pipe?

Four also answered these questions with fair intelligence, indicating that lead pipe was not so much used because of its expense, its liability to injury, and difficulty of hanging it below floors. They gave as advantages of lead pipe that it could be readily worked and bent in any direction.

3. Why are traps used?
   Name the different kinds of traps.
   Why are they vented?
   Draw a section of one form of kitchen sink trap.

Not much idea of the purpose of traps or their form or reason for venting was shown in the replies. Four stated that traps were to catch the grease, and two that they were to keep back the smell. Two mentioned S traps and drum traps. None gave the correct reason for venting traps and none made a sketch indicating a trap with vent pipe in proper place.

4. Draw a diagram of a hot water system, showing connections to the kitchen stove and hot water

tank. Show all piping and describe how the water circulates.

One pupil made a sketch showing all the connections with but one error; the sketches of two others showed almost all the pipes but not connected properly; two others made very rough sketches in which no correct ideas were evident, and two did not attempt to answer the question.

PAINTING SHOP

The paint shop is housed in a small room 12 ft. x 30 ft., with a vault extension under the entrance steps of the building, in which the paint and oil supplies are stored.

The boys wear drill overalls and jumpers 'which are laundered weekly. There are no lockers and the boys apparently take the first suit available when entering the shop.

On account of the change of instructors in March, it was impossible to check up the work performed by the pupils during the previous months of the school year. It was the opinion of the new instructor, however, that all the work shown in the records had been executed either wholly or in large part by the boys in the shop sections.

Among the most important items were painting outside sash and frames and glazing sash, Froebel school, 304 hours; glazing, 51 hours; painting domestic science room and six classrooms, 420 hours; painting stairs, stairway walls and stairway corridors, 176 hours; painting hallways, 80 hours; oiling gymnasium floor, 24 hours; glazing and painting frames and glass in nature study room, 36 hours; painting school wagons, 54 hours; shellacking 1,500 building blocks.

When the cabinet shop was in operation, considerable work in hardwood finishing of desks and cabinets was done by these classes, but since the abandonment of this shop the activities have been mainly confined to painting walls and ceilings of classrooms and halls, window frames and doors, both inside and out, various fixtures about the building, playground apparatus, and the houses for garden tools and materials.

In the course of this work, the boys erect the necessary scaffolds and perform a considerable part of their painting upon these stagings. Visitors have often commented upon the precarious appearance of the workers and their paint pots upon these narrow supports, and predicted disaster to both boy and paint pot. As a matter of fact, boys are pretty sure-footed and the number of accidents is reported as extremely small.

The work in the halls and stairways can be performed without interruption of the school routine, but the painting of classrooms in almost continuous use during the school day can be prosecuted only under difficulties. This work is often carried on when the rooms are occupied by classes and observation indicates that the danger of spotting the clothes of the regular pupils is not a small one. The inconvenience to the regular class work is, of course, obvious, although it should be borne in mind that the painting in any room occurs only at long intervals.

Painting is not one of the shop activities that succeeds in producing well sustained application. In every class observed, two or three pupils out of a group of five or six were idle much of the time.

Wall painting is, of course, a performance that requires careful and patient application to a very simple and monotonous operation for quite a period of time—a requirement that boys of twelve and fourteen are not very well prepared to fulfill after the appeal of novelty has worn off. It should be noted, on the other hand, that these rooms painted by pupils, although not evidencing expert work, are neat and satisfactory in general appearance. One room, indeed, represents an exceptionally pleasing piece of work. This is the room devoted to art work with the older pupils. The walls of this room are glazed or stippled with two or three coats of varying harmonious colors and are topped with a three-color frieze. The stencil for the frieze was developed by the art instructor with the coöperation of some of her pupils.

In all the painting work, the colors are mixed by the shop instructor and there appears to be very little information about these matters that gets over to the pupils; in fact, the painting work as a whole seems to contribute very little to the pupils beyond the manual experiences involved in spreading the paint.

In the instructor's opinion, six boys constitute the largest group that can be handled advantageously in practical work and boys from the seventh and eighth grades who have reached fourteen years of age are the best fitted for this work. During the spring term the groups assigned to this shop varied in size from 6 to 11 and the pupils came from the fourth grade to the third year of the high school.

No practical test in painting was given because the writer found it impossible to devise a test that would be at all satisfactory.

A written examination was given on May 4th to six boys who had had at least one term's experience in painting. One of these boys was from the seventh grade, three from the eighth, and two from the ninth. Three were fourteen years of age and three were fifteen. The test was as follows:

1. Name the different kinds of paint brushes and tell for what each is used.
2. What is white lead? How is it made and for what is it used?
   What is "zinc"? What are its advantages and disadvantages as a paint?
3. What is ochre?
   What is raw umber? What change takes place when it is burned?
   What is raw sienna? What takes place when this is burned?

4. What materials should be mixed together to make a paint ready for inside work?
   How many coats are needed for new inside woodwork? What proportions of different materials for each coat?
   How many coats are needed for new outside woodwork? What proportions of different materials for each coat?
5. How many ways may a hardwood desk top be finished? What are they?

The answers are summarized below:

1. Name the different kinds of paint brushes and tell for what each is used.

Only two boys attempted any answer to this question. One of these mentioned sash tools, varnish brushes, shellac brushes, brushes for signs, brushes for white lead; the other, sash brush and stippler.

2. (a) What is white lead? How is it made and for what is it used?

Only two answered this question and neither betrayed any ideas as to how white lead is made or why it is used in almost all paints.

(b) What is "zinc"? What are its advantages and disadvantages as a paint?

None attempted an answer.

3. (a) What is ochre?
   (b) What is raw umber? What change takes place when it is burned?
   (c) What is raw sienna? What takes place when this is burned?

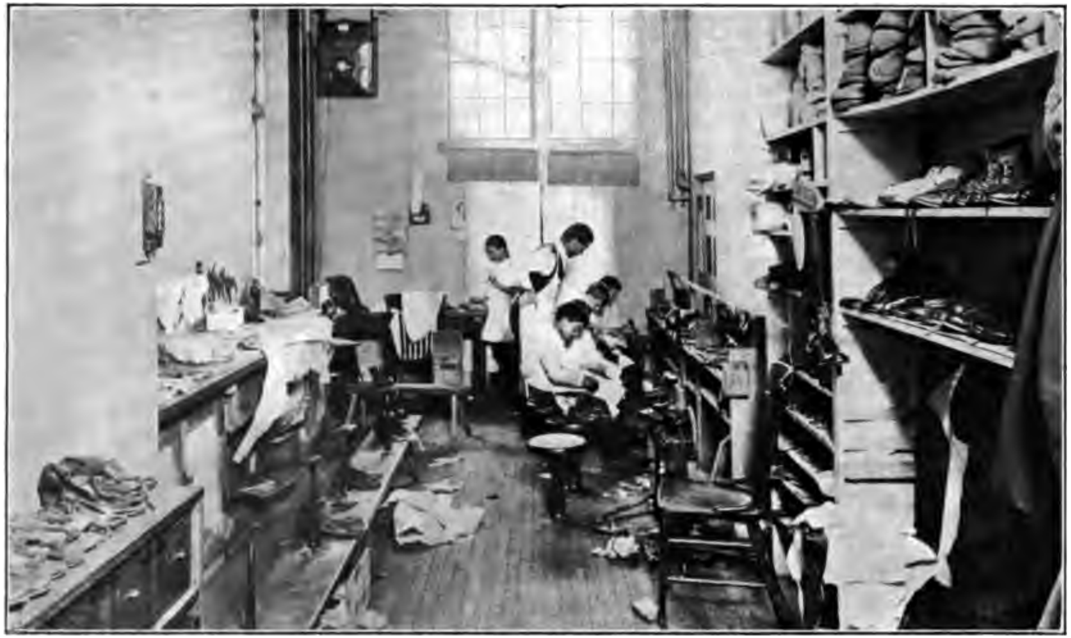
Only two answered. They noted that raw umber and raw sienna change color when burned, but said nothing as to the nature of the materials.

4. (a) What materials should be mixed together to make a paint ready for inside work?

Three attempted answers. None mentioned the four elements of white lead, color, raw oil, and turpentine. One said raw oil and white lead; one, turpentine, boiled oil, and color; one, turpentine and paint.

   (b) How many coats are needed for new inside woodwork? What proportions of different materials for each coat?
   (c) How many coats are needed for new outside woodwork? What proportions of different materials for each coat?

Three answered "two coats," this being the practice to which they were apparently most accustomed in their repainting work. Two answered "two or three." None attempted any statement about the proportions, although the meaning of this question was carefully explained during the examination.



Shoe Shop—Froebel School

5. How many ways may a hardwood desk top be finished? What are they?

One answered "by varnish"; another, "by varnish, shellac, stain or paint," and a third, "varnish or wax."

On the whole, the examination and many oral questions showed less knowledge about materials, or reasons for methods, or other related ideas on the part of these pupils than in the case of any other shop.

SHOE SHOP

The shoe shop, occupying a room 12 ft. x 30 ft., is a special and interesting feature, which differs materially from the other shops in character and is hardly to be regarded as an essential element of the plan of maintenance shops. As the little printed announcement states:

"A shoe repair shop has been installed at Froebel school, room 111, where any child can repair his own shoes, or for any member of his family. The material can be purchased in the shop, but the school can not furnish material free. The child must furnish his own material or bring the money to buy it."

Six to eight boys are regularly assigned to the shop and these boys bring their own and parents' shoes from home to be mended. The instructor explains to them the different kinds and grades of leather and the methods of repairing. When there is not enough of their own work they work on the shoes of others. Teachers and parents send shoes into the shop for repairs, for which they pay. Every day about six extra boys are found at work in the shop mending their own shoes.

For their own shoes, the boys bring leather obtained outside the school. All other things, such as thread and wax, are furnished free. The instructor also works on various jobs about the school, such as repairing footballs, baseballs, leather aprons, the covering of gymnasium apparatus, basketballs, and the asbestos curtain.

The shop has seven seats for lasts, but on several occasions groups of nine to twelve boys were observed. The pupils come from the fourth to the eighth grade. The group was always found working industriously and in the best of order. The spirit of the little shop is helpfulness, and however else it may be regarded, it is certainly a true example of community service as administered by the kindly, patient and indefatigable ex-cavalry soldier now in charge.

IV. SHOP WORK IN JEFFERSON SCHOOL

THE Jefferson school, erected in 1907, was the first in the system in which a manual training shop was installed. The manual training carried on there, while lacking those features most identified in the public mind with the industrial work of the Gary schools, is of some interest as illustrating the method of dealing with this subject in a school building provided with only one shop and no power tools.

The shop is located in the basement and is 25 ft. x 36 ft. in size. It contains a number of woodworking benches, a forge, a hand drill, a vise for holding iron pipe, cutting and threading tools for the same, and a few simple tools for sheet metal work. At one end is a stock room which is in charge of a pupil during class hours, and at the other is a 10 in. x 24 in. steam engine which supplies power for the electric light plant.

The aim of the work, as set forth in a printed statement furnished by the instructor, is given below:

I. To give children a knowledge of manipulation, names of tools, materials and applied science with enough shop work typifying various forms of industry, so that the child may devise and execute those projects that will assist him in self discovery, initiative, responsibility, and character building.

II. To give all children the understanding that labor is necessary in creating, and that those who work with hands also use their mental equipment.

III. To aid the child by giving such types of work that bear industrial significance and enriching his scope of knowledge regarding possibilities of the school which may be of practical value in his later life.

As will be noted, this statement is couched in terms of conventional manual training philosophy and it is this spirit that animates the work. Practical construction, as represented in the shops of the Emerson and Froebel schools, is absent. Repairs and equipment of the school plant are attempted only to a very small degree, and the bulk of the work takes the form of projects for the home and for individual use. The instructor is a school trained man with marked enthusiasm and devotion to his work. The engineer of the building serves as an assistant instructor.

In the Jefferson school pupils from the first to the lower fifth grade have drawing and benchwork one hour daily for twenty weeks. From the upper fifth to the eighth grade the schedule calls for twenty weeks of shop work for the boys in one hour periods and the same amount of time for drawing for ten weeks.

Composite Work Shop—Jefferson School

The attempt is made in the shop work to comprehend experiences in metal, wood, and other materials to such extent and at such times as the limited equipment will permit. The largest opportunity is in woodworking and the major part of the time is devoted to this field. Exercises are used to some extent for instruction, followed by individual projects of various kinds, apparatus for the playground, and repairs of school furniture. The tool room and several cupboards in the shop were built by the pupils. Some bookcases for the school have also been constructed in the past.

Chair caning is sometimes attempted, the chairs being brought from the pupils' homes. Opportunities for painting occasionally occur as in the case of the shop walls and built-in construction. In metal work not much can be accomplished with the very limited equipment, but attempts are made to provide a few exercises on the forge and in benchwork in iron or steel. Tin cups and filing boxes are made of sheet tin and 25 to 30 sheets of this material are reported as being used each half year. Cutting and threading of iron pipe is done to a very small extent. As there is no pipe of this kind in the plumbing system of the school no practical opportunities are presented in this direction, but during the period of the survey a few pipe handles for the vises of the woodworking benches were being made and applied. There is also some practice in bell wiring and in the making of induction coils.

Every three weeks two boys are assigned to assist in running the heating and power plant. During this time they feed coal to the boiler stoker and hot water stove, and clean, start, and oil the steam engine which operates the electric light plant.

A feature is made of the supervision of the shop by the pupils. One is appointed timekeeper, one is in charge of the stock, and one is tool foreman. Time cards are made out and a school bank system is maintained as in the Emerson and Froebel schools.[1]

The impressions gained by the writer during his two visits to the shop and mechanical drawing classes of the Jefferson school are, first, that the spirit exhibited by both instructors is excellent and that both are earnestly trying to convey the maximum amount of instruction to their classes under the limitations within which they work; second, that the theory of the instruction is pitched rather higher than the actual results achieved; that too many things are attempted with the equipment at hand; that often so little time is given to excursions into various fields that the results obtained are inadequate and are not calculated to develop proper standards of workmanship; and, finally, that the noise and freedom in the shop seem more conspicuous than earnestness of application.

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[1] See pages 102 to 105.

V. DRAWING AND HANDWORK

MECHANICAL AND ARCHITECTURAL DRAWING

THE instruction in mechanical drawing in the Emerson school is given in a room on the third floor, 27 ft. x 50 ft. In the Froebel school it is provided in a rather small room, 23 ft. x 31 ft. The work in the two schools is along substantially the same lines, but our description is limited to that of Emerson where it has been developed more systematically.

Groups of 5 to 8 pupils from the third, fourth, and fifth grades are given instruction at the same time that groups from later grades are being taught. In order to deal with these young pupils and allow the instructor to apply almost all his time to those of the sixth grade and upward, a special scheme of instruction has been devised. This consists of a series of blueprints which are given to the younger group and which contain simple working drawings and directions as to copying, modification, or additions by the pupils. The drawings are all of simple wooden objects or constructive details. Sometimes the blueprint calls for a drawing to a different scale, sometimes a third view is required.

The system is successful in achieving its main purpose, which is to occupy these younger pupils without requiring much attention from the instructor. It undoubtedly develops some ability on the part of these pupils to read simple working drawings and to execute the particular drawings with which they deal. There is practically no work from the object, however, and the plan is obviously lacking in variety and stimulating quality. There can be no doubt that a much smaller amount of time with direct instruction would produce equal or superior results. Indeed, with such a formal subject as instrumental mechanical drawing, there seems to be a very serious question whether the total result of these three years is at all commensurate with the time spent. The situation is one that brings forward the same question as that raised by the younger children in the shops, viz., whether it is desirable to place these pupils on the same schedule and subjects as older pupils, where they are necessarily attempting work rather beyond their capacities, as gauged by real achievement, or whether it would not be better to develop a course of study and time schedule especially suited to their needs.[1]

The plan of work for the sixth and succeeding grades is as follows:

SIXTH GRADE

1. A solid line foundation plan of a two room house changed from $\frac{1}{16}$ in. to $\frac{1}{4}$ in. scale, dimensions being given.

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[1] See discussion pp. 18 to 23.

2. Conventional rendering of door frames, doors, and windows as used in floor plans.
3. First floor plan made from foundation plan bringing in renderings learned in 2.
4. Rendering of windows in elevation.
5. Rendering of doors in elevation.
6. Front elevation of house rendered in $\frac{1}{4}$ in. scale from drawing in $\frac{3}{16}$ in. scale with details gained from 4 and 5.
7. Side elevation of same.
8. Rear elevation worked out from 6 and 7.

SEVENTH OR EIGHTH GRADE

1. Window or door section elaborated from those of sixth grade.
2. Elevation window developed from that of sixth grade with notes as to standard sizes of details.
3. Elevation door on similar lines.
4. Plan of house with four rooms and a porch allowing certain opportunities for modification by pupil.
5. Foundation plan of same.
6. Working up of front elevation with only one dimension given.
7. Side elevation.

8. 9. 10. 11. } Examples of constructive details involved in house.

HIGH SCHOOL

Pupils elect either architectural or mechanical drawing course. According to the instructor, work is taken by those electing the subject commonly for four terms during the first two high school years.

ARCHITECTURAL COURSE

FIRST TERM

Eight drawings illustrating problems in orthographic projection, including completion of views, solids cut by planes, intersection of solids and developments.

SECOND TERM

Design of one story building. Details of construction and of provisions for plumbing and heating of above building. Estimates of cost of materials of same.

THIRD TERM

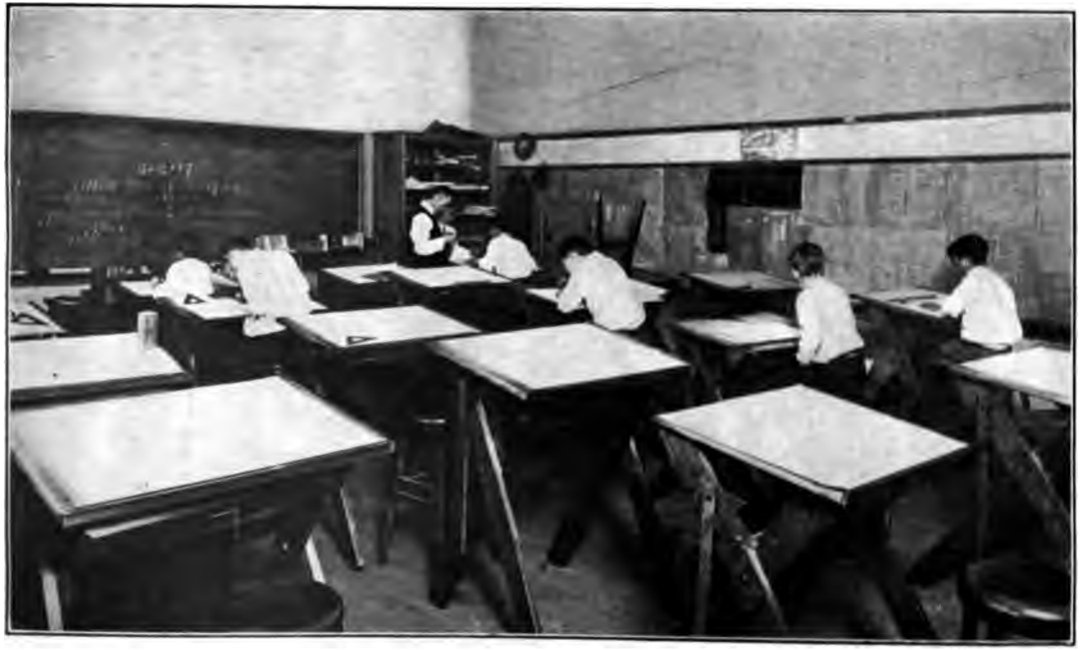
Design of two story building. Estimate of costs with the elements of specifications.

FOURTH TERM

Study of the architectural orders.

FIFTH TERM

Design of bungalow with details of interior finish. Cost estimates.



Mechanical Drawing Room—Froebel School

SIXTH TERM

Perspective drawing of above houses.

Mechanical Course

FIRST TERM

Same series of projection drawings as in architectural course followed by conventional rendering of screw threads and few machine details.

SECOND TERM

Bolts, nuts, and screws. Sketching on section paper of details of engine, small pump, valves, and small electric motor. Drawings from sketches.

THIRD TERM

Assembly drawing of lathe and pump.

FOURTH TERM

Cams, quick return motions, spur gears.

FIFTH TERM

Bevel and spiral gears.

SIXTH TERM

Gas engine design.

These several courses are practical and unpretentious in character and on the whole seem well adapted to the interests and capacities of the boys for whom they are intended. The architectural course perhaps errs somewhat in excessive repetition of motive and the mechanical course may sound a little ambitious in the plan for the final term, but throughout the teaching approach had been carefully planned and the results secured were excellent. Too much praise cannot be accorded to the quality of teaching in this department in the Emerson school and the resultant atmosphere of earnest application always found when classes were at work.

The instruction in the Froebel school which is somewhat more individual in character and consequently rather more varied in form is also well organized and efficiently conducted. In this school pupils from the upper grades are used for one term periods to assist in the instruction of younger pupils.

HANDWORK AND DRAWING

For the first three grades handwork and drawing are scheduled in the Emerson school for one period a day throughout the year, while in the Froebel school two hours a day are divided between handwork and drawing, music, nature study, and application for these classes. An average of 30 minutes a day is given to application work and the remaining 90 minutes are divided among the three other subjects by days, weeks, months, or terms, so that each of these departments receives an average of 30 minutes a day.

No attempt to analyze this work in detail will be made; we shall merely sketch its general character. Classes in

Handwork Room—Jefferson School

each grade in both schools were visited and the work as a whole examined as far as practicable.

The teachers in this lower grade work have not received extensive special training in art or manual training, but have been drawn from the staff of regular primary teachers as they indicated particular inclination or fitness. They all show much earnestness and zeal in organizing their courses along the lines of accepted standards and considerable ability in presentation. There are, however, no uniformly planned courses.

The work in the Froebel school was conducted in regular classrooms, especially equipped, while in the Emerson some of these lower classes were in a room furnished with stools and drawing tables for older pupils. Both freehand paper cutting to illustrate animals and stories, and paper cutting and folding to produce geometrical and other forms, are much used in the first grade. In addition considerable use is made of colored crayons in depicting animal and human figures and illustrating stories.

In the second grade the paper cutting and crayon work is continued and some water color rendering of flowers is attempted. In the Emerson school an interesting scheme of arranging toothpicks to represent figures in motion was observed, which was followed by freehand sketches of figures engaged in some kind of activity.

The paper work continued into the third grade. Paper boxes decorated with crayons were made and some very expressive freehand cutting illustrating the occupations of the fireman, policeman, letter carrier, motorman, etc., was achieved.

Brush work in color and colored crayons is also continued. One lesson observed was the drawing of birds from colored plates with crayon and it was evident from questions put to the pupils that considerable reading and writing centered about the objects that were drawn.

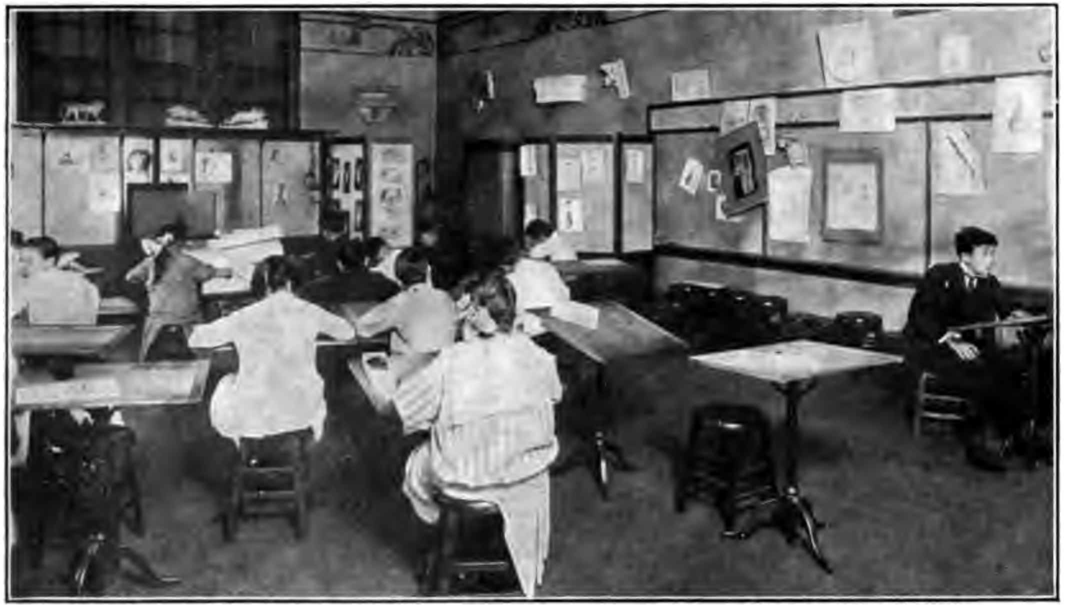
In one class a lesson in making color designs for oilcloths and rugs was observed, in which the usual spectacle was witnessed of pupils loyally striving to suppress their own inclinations and to achieve "harmonious" and subdued arrangements which they had come to know the teacher wanted.

In this grade clay modeling is introduced and birds' nests and small vessels are reproduced. With the exception of this work no evidence of any handwork in these lower grades was observed that affords exercise to the larger muscles of hand and arm or requires anything but small and fine finger movements. It is possible, however, that just this kind of work is afforded by the gardening.

In the Froebel school the presence of pupil assistants from the sixth grade was noted in several classes. These assistants help to keep the room tidy, wash brushes, etc., and sometimes help the pupils with their tasks.

FREEHAND DRAWING

Pupils above the third grade in both the Emerson and Froebel schools have the choice of freehand or mechanical drawing for the equivalent of one term each year. Com-



Art Studio—Emerson School

monly the boys take mechanical drawing, the girls, freehand drawing. This latter work, which should more properly be called art instruction, as it comprehends practice with water color, crayon, clay and design as well as in freehand drawing, is conducted in each school in specially equipped rooms provided with stools and drawing tables. In both these rooms the walls have been finished in very attractive fashion by the painting classes and in each case a stenciled frieze, the design for which was made by the art pupils, is carried around the room at the top. The work in the two schools is along similar lines. The description below applies mainly to that of the Froebel school.

In the grammar grades the time is about equally divided between freehand drawing and design. Charcoal is introduced in the sixth grade and still life studies are made in this medium as well as with crayon. Later simple landscape renderings in crayon are made and a few water color studies of trees and flowers. Some drawings of the figure in pencil were seen and some costume studies made in colored paper.

Cardboard construction is practised in the upper grammar grades and clay is used to a small extent throughout the grades and high school.

A few examples of reed and raffia baskets had been made in the sixth and seventh grades, but not carried very far on account of the expense. The designing attempted is of a simple character reaching into a few examples of rugs and wall papers.

In the high school some good work in still life with pencil and with crayon was seen. Boys are sometimes given practice in interpreting colored reproductions in pen and ink, while the girls have pencil rendering of landscapes and make some studies of their fellow pupils in line and crayon.

More attention is given to design in the Emerson school than in the Froebel. Some of this work takes the direction of book covers, metal work, and the elements of costume design. The attempt is made to carry out all designs made in the high school in the way of simple jewelry or other metal work or in stencils for the decoration of curtains, walls, furniture covers, sofa pillows, etc.

The high school groups observed in this school were composed of pupils ranging from beginners to those who had had two or three years' experience in drawing. This situation, which results from the elective system in operation in the high school, together with the fact that the attendance was quite irregular, was felt by the teacher to prevent the achievement of high standards and to make against continuity of interest and effort.

VI. FORMS AND RECORDS

SHOP ORDERS

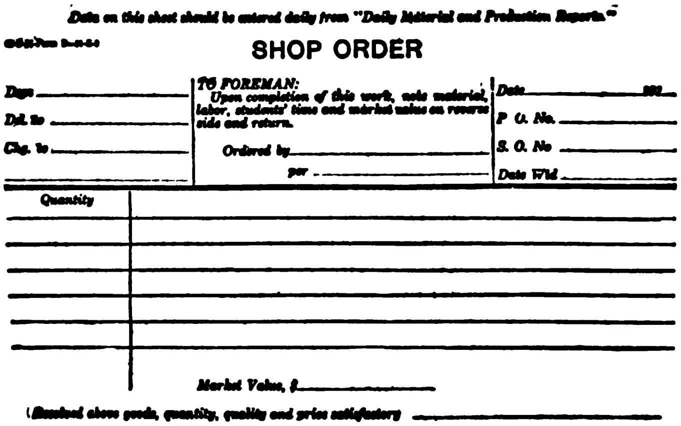
THE plan by which the orders for work reached the shops in the school year 1915–16 was as follows: Before the beginning of the school year a shop budget was prepared showing the amounts necessary to run the different shops and placing certain amounts at the disposal of the various schools. The responsibility for deciding what repairs and what new equipment were to be made rested on the principals of the different schools and from them issued the requisitions for new material or repairs.

Specific orders for productive jobs and specific or blanket orders for repair jobs were issued to the shop foreman or instructor on the form shown on the following page, stating the quantity and nature of the work to be done and the department to which it is to be charged.

TIME AND COST RECORDS

The instructor kept a daily material and production report upon the form which is printed on page 101.

When the work was performed by students, there was put under "Hours—Instructor" an estimate of the time it would have required the instructor to execute the work; or, if it was executed by him alone, there was reported the instructor's own time. When the job was completed, a report, based on the data entered in the daily reports, was copied on the back of the shop order blank, shown on page 102. The data in these two records should, of course, correspond. This was not always found to be the case, as is indicated in the separate analysis of shop costs.[1] Upon the shop order blank the instructor also set down the appraised value of the work on the basis of his estimate of the market price.



Data on this sheet should be entered daily from "Daily Material and Production Reports."

SHOP ORDER

Days ____________

Del. to ____________

Chg. to ____________

TO FOREMAN:
Upon completion of this work, note material, labor, students' time and market value on reverse side and return.

Ordered by ____________

per ____________

Date ____________

P. O. No. ____________

S. O. No ____________

Date W'd ____________

Quantity

Market Value, $ ____________

(Received above goods, quantity, quality and price satisfactory ____________

This form was then sent to the vocational office where from these data a weekly material and production report, giving the amount of time spent on finished jobs, and the cost reckoned on the basis of material consumed and the instructor's time, was made out by pupils. The appraised value of the work as set down by the instructor in his report was also entered. This last figure formed the basis of the value of productive work performed in the shops as given in the financial statement of the school auditor.

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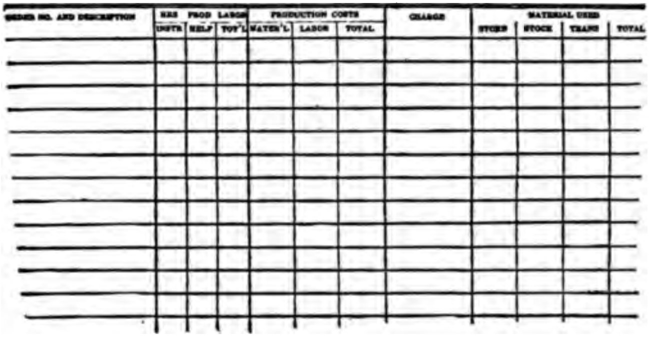
[1] See Costs, Ch. V.

Daily Material and Production Report



__________191__ __________Shop __________Instructor

ORDER NO. AND DESCRIPTION	HRS PROD LABOR			PRODUCTION COSTS			CHARGE	MATERIAL USED			
	INSTR	HELP	TOT'L	MATER'L	LABOR	TOTAL		STORES	STOCK	TRANS	TOTAL

The statement was made by two of the instructors and confirmed by the shop supervisor that the superintendent of schools directed that the full time of the shop instructors be charged against production or repair work. It is evident if this policy is carried out that it will tend not only to increase the time reported for production or repair jobs, but the appraised value noted by the instructor as well.

The weekly material and production report form is shown on page 103.

TIME CARDS AND SCHOOL BANK

A feature of the high school shop work in the Emerson school is a system of time cards made out by the students and deposited in a school bank. These cards are the basis upon which the student eventually receives credit for his shop work in the school records. The same system is used to some extent in the grades, but in this case the cards are not essential for final credit.

BACK OF SHOP ORDER

Date	Material Used	Value				Hrs. Prod. Labor			Production Costs		
	Description	Store	Stock	Transfer	Total	Instr.	Help	Total	Material	Labor	Total

Total______________________________________

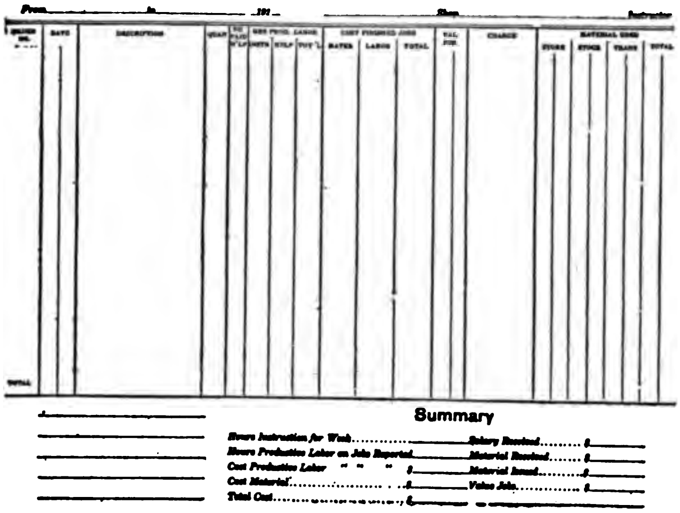
No. Paid Help__________ Student Time__________ Market Value $__________

Date Finished_______________

A time card like the one shown on page 104 is supposed to be furnished to the pupil at the beginning of each week, but, as a matter of fact, is usually kept for him in the instructor's desk. The pupil is supposed to fill in his time each day before leaving the shop, together with a record of the work accomplished and tools used. At the end of the week the instructor signs the card and indicates a rate per hour. This rate is based on a maximum of 60 cents for thoroughly satisfactory work and lower rates of 30, 45, 55 cents, etc., are supposed to be given when the performance does not reach the desired standard.

The time cards, however, are very hurriedly and incompletely filled out by the students. The job or tools used are rarely noted and often the name of the shop itself is omitted. In the matter of rates accorded by the instructor very little differentiation appears. When the student begins in the shop a rate of 50 cents an hour or even lower may be assigned, but subsequently the cards bear uniformly the maximum rate. Many cards

Weekly Material and Production Report



From ______ to ______ 191_ ______ Shop ______ Instructor

TOTAL

Summary

Hours Instruction for Week............______ Salary Received......... $______
Hours Production Labor on Jobs Reported______ Material Received....... $______
Cost Production Labor " " " $\_\_\_\_\_\_ Material Issued.........$______
Cost Material.......................$______ Value Jobs............. $______
Total Cost..........................$______

were found in the office containing no rate whatever. Apparently, quality of workmanship plays very little part in determining the assigned figure and, in consequence, the system as actually carried out can hardly be much of an incentive toward excellence of workmanship; in the main it merely records the time spent by the individual pupils in the shop.

Form R.F.M. 1

VOCATIONAL TIME CARD

Name..Grade..............Age..........

Week Ending....................Shop....................Rate Per Hr..........

	Began	*Tools Used*	*Work Done*	*Quit*	*Hrs.*
Mon.					
Tu.					
Wed.					
Th.					
Fri.					
Sat.					

Instructor.. Amt. $..............

These cards are sent to the vocational office and a weekly payroll is made up. Upon this record checks drawn on the school bank are made out and issued to each shop pupil. When these checks accumulate to the value of $80.00 a certificate is issued which entitles the holder to one high school credit. This is entered in the school records and counts toward graduation.

In order to guard against loss of the checks and to secure a convenient record according to business usage the school bank receives and credits them. The student brings his checks to the bank, fills out a printed deposit slip, and is given a pass book in which the deposits are recorded.

"All the clerical work and bookkeeping connected with the time-keeping, the school bank, the issuing of checks, the making out of pay-roll, the employment bureau, etc., is done by students who are in the beginning commercial work, and checked over at frequent intervals by more advanced students."[1]

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[1] From an article by the supervisor of vocational work.

VII. SUMMARY AND CONCLUSIONS

BEFORE attempting to evaluate the shop work of the Gary schools, it is essential that the point of view of the superintendent should first be set forth and the attitude of the writer toward this point of view be defined. Otherwise, the danger so clearly noted by the Autocrat of arguing over details when there is a difference as to fundamental principles is imminent.

The following statements are accepted by the superintendent as fairly and adequately expressing the aims of the industrial arts work at Gary.

"1. It is held that every boy throughout his entire school career should have substantial opportunity to participate in numerous forms of industrial work.

"2. So far as this industrial work has been introduced into the Gary schools, it has only incidental bearing upon preparation for a wage earning vocation for pupils below sixteen years of age. Its primary purpose is to contribute to the general experience, general intelligence, and general development of the pupil.

"3. As far as practicable, it is designed that this industrial work shall be representative of the various forms of practical work which men and women now do in the world.

"4. It is desirable, therefore, that all the teachers of this practical work shall themselves be, first of all, skilled artisans in their respective callings.

"5. It is desirable, secondly, that much of the work done by the teachers and pupils shall have a commercial value.

"6. It is not practicable at present to do work of commercial value either for the homes of the pupils or for sale in the market.

"7. The one large field left to the school wherein it can do practical work having commercial value is in connection with the school system itself. Therefore, the school system reserves as fields of practical work for its pupils, and for the industrial teachers of these pupils, such departments as printing, maintenance and repair of buildings, and equipment of the school plant. The participation of pupils in any form of productive work, while expected to give a valuable product, does not have vocational training as an end for pupils below sixteen years of age.

"8. Such work, to reach its full educational value, should consist of direct manual experience in construction work, and the illumination of these experiences by giving the pupils the reasons for the methods employed, a knowledge of the more important properties of materials used, some idea as to where these materials come from and how they are manufactured, and how similar work is done under commercial conditions. Experience has shown, however, that children fourteen years of age and under are interested primarily in the direct manual experiences."

The foregoing eight statements embody, as has been said, the philosophy of the shop work at Gary as the Gary authorities themselves understand and interpret it. With much that is embodied in these statements the writer finds himself in agreement; to portions he dissents and his own convictions embrace certain other points of view regarding the functions of industrial work in the public schools.

The provision for a liberal amount of industrial work for all pupils up to fourteen years of age he believes to be essential to a healthy, wholesome, and complete education. He questions, however, whether, after boys have reached fourteen years of age, such training is justified in any large measure, unless it provides elective opportunities for experiences that are truly typical of vocational practice and help prepare for advantageous entrance into trades at fifteen, sixteen or over. To provide for boys after they have reached fourteen years of age industrial experience that is aimed at general development may well be an ideal of liberal training for boys who are not going to be trade workers; but for those who are going into industry such a plan does not seem to represent ideal service on the part of the school. Such a proposition represents the cultural view of education; it savors much of the early philosophy of the manual training high school and refuses to take account of the vocational differentiation that faces public school pupils and the varying lengths of their school lives; or, at least, it refuses to admit that such differentiation demands varying educational opportunities for different groups.

In the case of boys who must enter early into industrial work, the writer believes that when they have reached the wage earning age at the end of the compulsory school period (usually fourteen) they are entitled to specialized training, as far as it is practicable in the public schools, which will better prepare them for entrance into industry and which will help to hold them in school until they reach the age of sixteen.

This belief is in harmony with legislative provisions for such training in a number of the states, with specific propositions regarding the disbursement of federal money contained in the Smith-Hughes act, and with the endorsement of such training in the report of the American Federation of Labor on industrial education. It also has an important bearing upon the tendency, already evident in certain states, to raise the age of compulsory schooling above fourteen.

It is manifest that this point of view is not recognized either in the aims or the practice of the Gary shop work. This work represents a uniform plan of industrial experiences similar in character and extent throughout the entire range of school life, varied only by the fact that the work is compulsory from the fourth to the eighth grade and elective in the high school. Why the phrase "below sixteen years of age" is inserted in paragraphs

2 and 7 is not clear to the writer. Certainly no difference in either quality of experiences or instruction was observed in the case of boys sixteen years of age or over in any of the shops. For the boy of sixteen the training could hardly be of any greater vocational value than for the boy of twelve except to the extent that the older boy obtained more meaning from his experiences.

With statement 3 the writer agrees, but he would note that school shops on the plant maintenance basis can never be representative in any large sense of the various forms of practical work that men and women do in the world.

With paragraph 4 he is in agreement, at least as concerns instruction from the sixth grade up. It is equally essential, however, that these instructors also have adequate and appropriate school training.

In regard to paragraphs 6 and 7, he agrees that it is not practicable at present to do work of commercial value, either for the homes of pupils or for sale in the market, but he believes it is practicable when pupils are fourteen years of age or over to introduce processes, illustrations, and explanations that will develop a familiarity and understanding of commercial industrial practice.

With paragraph 8 he is in agreement, but as will be indicated later he does not believe that the last statement is a valid excuse for limiting industrial work to purely manual experiences.

Turning to the work itself, the fact should be again recorded that the Gary plan of shop work is neither in theory nor practice a system of vocational training. It does not offer opportunities for the acquirement of specialized knowledge and specialized skill by those who expect to apply such knowledge and skill in wage earning. For this purpose the scope of a plant maintenance system is too narrow, the character of the Gary shops inadequate, and the nature of the industrial experiences too limited.

Having endeavored to make this point clear, the writer will direct his criticisms largely to the practice observed in the shops as related to the statement of aim and standards approved by the superintendent of schools.

From this standpoint the first conviction to be recorded is that the maintenance plan as carried out in these shops has many elements both of strength and weakness.

For one thing, the pupils show evident interest and enjoyment in their work. One gains a strong impression at Gary that the school is not a secondary thing in the boy's life, a thing to be escaped from as quickly as possible, but that it is the big thing which commands by far the larger part of his energies and interests. To this condition of mind the shop work undoubtedly contributes an important element. The shops themselves, although conducted with considerable freedom, generally reflect an atmosphere of real work, and the pupils are often found successfully carrying on operations and achieving results ordinarily judged quite beyond the capacity of boys of their age. The relations between the boys and the instructors in the shops are for the most part satisfactory and commendable. The instructors as a rule show much patience in directing the boys, helping them out of difficulties, and answering their many questions. In some of the shops there is much of true comradeship between the boys and the instructors built on mutual confidence and respect.

Furthermore, the pupils undoubtedly gain first-hand contact with many real phases of industry, and a healthy stimulation of interest through dealing with real problems and real quantities. All this means a vitality and educative influence far superior to the conventional manual training.

On the other hand, the work in many of the Gary shops is narrow as to scope and extremely empirical as to method. There is lacking throughout a blending of instruction with construction that would serve to widen out the concrete experiences into returns of larger meaning. The effect of a practically unregulated and often continuous demand upon the shops for productive or repair work in the case of some of the shops prevents time being given to such instruction. All that can be done is to execute the work and see that it comes up to the necessary practical requirements. No time is left to bring out the principles that may be involved or to indicate other methods by which the result would be accomplished in commercial practice.

Furthermore, in the Gary scheme difficult work is very likely to precede the simpler. Too much should not be made of this point, but it is a fact that in any plan in which the shop work depends entirely upon the maintenance and repair needs unexpected demands are likely to throw out any comprehensive and orderly plan, and for young workers this consideration is of some importance. In the case of certain shops, notably the plumbing and in lesser degree the sheet metal, these demands sometimes take the instructor away from his room and leave the pupils without guidance.

The extent to which the maintenance idea limits the value of the shop experience varies very greatly in the different shops. The plumbing shop probably suffers most. Here the small variety of practical work, together with constant demands upon the instructor's time for repairs in different parts of the building, in which only one or two boys can be actually engaged to advantage, and for similar repairs in other buildings of the system, has resulted, as far as the writer's observation and studies have extended, in very little, if any, instruction in the rich field of plumbing practice, as related to sanitation and physical science.

In the machine shop the demands of productive work tend to limit instruction to merely the specific practical directions required by a particular job. The instructor who has to help five or six boys at work upon some piece of construction work on as many machine tools, while he himself is at work at some particularly exacting operation, has little chance during the long school day to think of more than the successful forwarding of his productive work. In consequence, there is practically no class instruction, little explanation of the reasons for common operations, and extremely limited information even as to the mechanism of the shop tools.

In the forge shop, foundry, sheet metal, and particularly in the printing shop, where the entire class is often at work at similar operations upon one job or a number of similar jobs, the conditions admit of group or individual instruction and one or the other of these has been utilized in these shops to a limited extent. For example, in the forge shop such instruction was apparently confined pretty much to directions as to method and some indication of the reasons for the same; in the tinsmithing shop it was constantly taking form in some very excellent explanations and truly excellent examples of drawing out ideas as to materials and methods by well directed questions. Again, in the printing shop at the Froebel school admirable instruction has been given in regard to technical terms, methods, and materials that might readily be expanded further so as to develop a real appreciation of printing methods in modern business. In painting, although the conditions do not seem to prevent group instruction, very little has been done except to teach the boys how to wield a brush properly and to give them abundant opportunities for practice.

In all cases, the shopmen doubtless feel that they are constantly explaining matters, but the fact is that instruction in any full sense has not been a serious item in the business of the maintenance and repair department. It has, apparently, never been insisted upon as an essential feature of the duties of the shop staff. It has certainly never been organized in a systematic way. Apparently no attempt has ever been made to have the pupils take notes of the simplest kind. No tests of shop or industrial information have been made. No practical correlations with the shop experiences have been observed in mathematics or science work. No charts or sketches on the blackboard have been employed, and even trade catalogues with their abundant illustrative matter have been used only in a most limited degree. In some cases it is hardly an overstatement to say that the shop work represents a maximum of activity with a minimum of thought as to the thing being done.

Much of this is, of course, due to the fact that artisan-teachers are employed who commonly have not the habit or skill in setting forth reasons for their methods or in widening out the implications of a specific experience. Much, however, could be done with an intelligent body of shopmen, such as those in the Gary schools, by a supervision which puts due emphasis upon the instruction side of the shop work and which brings forward suggestions and examples of methods and materials of teaching.

In justice to the present situation, it should be stated that during the period of the survey a meeting of the shop staff, presided over by the supervisor, was held to consider the character of information that should be brought forward in each shop. Written suggestions from each shop head, covering a large range and variety of information about tools and shop materials and methods, were presented at this meeting and were in part discussed. If a small fraction of this material could be brought into the shop experience in an organized way so as to get really over into the minds of the pupils, the unbalanced character of the present work would be partly remedied. Something more, however, than the preparation of lists of instruction material will be necessary to achieve this result.

What the writer has in mind in the above criticisms is not that the shop work should be weighted down by didactic teaching or that instruction through words should take the place of active constructive experiences, but simply that the reasons for directed performances should be brought out and that manual experiences should be made the opportunity incidentally and naturally for enlarging the intellectual conception of the thing done.

The remark was often heard in regard to the methods of the Gary shop work that the plan of industrial training provided, whatever its limitations, is the only one financially possible; and whatever educational advantages are derived by the pupils should be regarded as so much gain. This argument is hardly one that can serve to excuse educational shortcomings for it is clear that the primary justification of the Gary school shops must be found on educational and not on economic grounds. In point of fact, the report on Costs shows that when all shops are taken together and credited with the labor and material cost of their products, they are only 54 per cent. self-supporting, and that the shops which are operated primarily on a productive basis, when considered separately, are slightly less than 70 per cent. self-supporting.[1]

If the above situation, on the other hand, is in any way due to the fact noted by the superintendent that "no one can be permitted to give instruction in the public schools of Indiana unless he is licensed," it would seem to form an indictment of a system which places pupils under the guidance and control of persons who cannot obtain licenses to teach.

The theory which seeks to defend the quality of the experiences afforded by these shops on the ground that the shops are purely productive agencies which owe their existence in the school system to economic reasons, and that the pupils work in them on the "coöperative" principle, as represented by the system in vogue in the School of Engineering of the University of Cincinnati, in order to gain experiences in mechanical processes, leaving "theory" teaching to be done by other instructors in the school, does not seem to have a sound educational basis. In the first place, as has been previously pointed out, the shops cannot claim justification solely from the economic standpoint. In the second place, the needs of young boys from ten to sixteen years of age in the matter of guidance and intellectual help are radically different from those of engineering school students.

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[1] Costs, Ch. V.

Furthermore, in the practice of the coöperative plan at the University of Cincinnati it has been found necessary to introduce "coördinators" who follow the students in the shops and see that the situations met with there are explained in the classrooms. No such provision is made in the Gary shops, and it is much to be doubted if effective results would follow were such a plan in operation. What is needed with pupils of the age present in these shops is illumination of the shop experiences at the moment of their occurrence.

Some of the defects noted above are due to the absence of a proper measure of supervisory control. In the plan pursued during the year 1915–16 and described in a previous section, the responsibility of deciding what repairs and what new equipment were to be made was placed upon the principals of the different schools. The character and order of these demands were consequently unregulated by the supervisor who is responsible for the shop organization and the educational results of the shop work. This brings about a break or lack of control in the system, which is obviously likely to react prejudicially upon the pupil.

If an educational return is to be secured it is evident that the maintenance idea cannot be left to run itself. It must be carefully supervised, guided and administered through definite and seriously thought out plans, with constant oversight as to the specific situations that arise. If the system is to be administered with first consideration for the boy there must be opportunity for regulation of practical demands by the same officer who controls the instruction, in such a way as to shape the total influences upon the boy to the maximum advantage. In other words, this officer should not only have the power, but he should make it his first concern to adjust the character and sequence of the work so as to produce the best educational results and should see to it that instruction is as important a consideration as the job itself.

Looked at from the cultural point of view the limited scope of a system of plant maintenance shops is perhaps not serious; but from the vocational standpoint the maintenance plan, at least for larger cities with varied industries, is clearly not sufficient for the practical training of boys who are to enter industry on the practical side.

At this point it may be worth while to refer to a charge that has been made against the Gary schools, viz., that the whole system is fathered and supported by the United States Steel Corporation as a device to train a supply of labor for the mills. Whatever else may be said of the Gary plan it must be evident to any serious observer that the mind of man could hardly devise a plan less calculated to accomplish this particular object than the system of training represented in the school shops. Indeed, as has been previously indicated, a valid criticism, in the judgment of the writer, lies against the shop training in that it takes too little account of the industrial environment and gives too little consideration to the responsibility of preparing pupils for advantageous entrance into the community industries.

Turning to certain practical aspects of the problem, it seems clear that if the maintenance policy is conceived as involving the operation of a number of shops in which nothing but constructive work ministering to the school plant is performed, the plan is incapable of permanently supplying sufficient material for many of the shops unless the school plant is in a constant state of growth and the shops are confined to one or two central schools. When the school buildings are fully equipped with sinks, closets, showers, swimming pool fixtures, etc., the plumbing shop can hardly be continued as a necessary maintenance factor. It is also difficult to see how the foundry and forge shop can long be justified from this standpoint. For one sheet metal shop in the school system there is likely to be an outlet for some time to come in the way of pails and buckets, garden and nature study apparatus, and other small articles. For the painting shop a shifting existence from school to school can be imagined. A small machine shop like that in the Emerson school with its limited number of pupils will, perhaps, always have enough to do in connection with the power plants of the more modern schools, and in making apparatus for the science laboratories. The printing shops are the only ones, however, that seem to have a truly permanent place from the maintenance standpoint. The school demands, which are constant and considerable for the products of these shops, not only guarantee their economic future, but give them a range of work more nearly typical of practical conditions than any other shop.

From these considerations it appears that if the Gary schools are to keep the practical work idea to the front, they will be forced in the near future either to make use of a wider field of shop activities than those based strictly upon maintenance of the school plant, or to introduce other forms of constructive work.

This point should, perhaps, not be overemphasized, inasmuch as the integrity of the plan need not necessarily be lost if constructive exercises are introduced to some extent or one form of practical work is substituted for another. There is nothing in the attitude of the Gary school authorities, as far as the writer understands, that would prevent such modifications. Indeed, the existence of a woodworking shop on a manual training basis in the Froebel school and the giving up of two woodworking shops in the Emerson school seem to indicate a recognition of this principle. The only point worth making in this connection is that construction and repair work limited to the upkeep and expansion of the school plant does not offer sufficient material to serve as a permanent and sole basis for shop work experiences on the present time allotment of the Gary schools.

In conclusion, to sum up the more important points outlined above, it should be understood that the organization and conduct of the Gary shops represent the cultural point of view in education. Considered from this point of view the plan of shop work makes a rich contribution to educational practice, perhaps surpassing in completeness and effectiveness—at least in the elementary school field—anything previously developed in this country. At the same time, the writer wishes to record his belief that the present conduct of the work is not such as to secure satisfactory educational returns. To accomplish this, there must be introduced a greater breadth of instruction, which will bring more of appreciation and understanding out of the shop experiences, and a supervision which makes a place for such instruction and points the way to good teaching.

On the other hand, it should be emphasized that the Gary shop work does not present a system of vocational training. It represents a very liberal set of industrial experiences calculated to broaden, enrich, and stimulate the school life of the pupils. It should be considered and evaluated from that point of view and not as a contribution to vocational training.

APPENDIX

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I. SHOP PRODUCTS

THE following tables give in detail the products of the several school shops, as copied from the original records. For methods by which the production cost and the estimated market value are determined, the reader is referred to the report on Costs, Chapter V.

TABLE IV—*Continued*

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1916						
2/16	Tickets for Night School......		$ .25	$ .27	$ .52	$ .52
2/14	Paper cut and paper..........		.80	.50	1.30	1.30
2/16	Sheets (2) 21 x 27 in.—3-ply.....		.17	.28	.45	.45
2/17	Credit certificates............	1,000	1.00	1.00	2.00	5.00
2/24	Ledger headings..............			4.50	4.50	4.50
2/29	Meter blanks.................	5,000	2.00	7.25	9.25	12.50
2/24	Dance programs..............		.50	1.25	1.75	2.50
3/9	Label cards..................	10	.25	2.50	2.75	4.00
3/16	Invitations..................	150				2.50
2/24	Blotters.....................		4.75	5.50	10.25	15.25
2/28	Programs....................		43.33	69.25	112.58	140.75
3/1	Moving-picture titles..........		30.00	30.50	60.50	75.00
2/12	Absence reports..............		8.42	1.58	10.00	15.00
3/28	Excuse and report cards......		2.50	25.00	27.50	45.00
3/30	Class schedules..............		.50	14.00	14.50	23.00
4/12	Admittance cards.............		2.40	3.00	5.40	7.75
"	Mothers' meeting invitations...		.35	1.00	1.35	2.50
4/11	Emersonian..................		15.00	34.50	49.50	70.00
4/14	Bank-book sheets.............		2.00	4.50	6.50	8.75
4/29	Checks......................		4.00	4.50	8.50	10.75
5/5	Auditorium data..............		.40	2.00	2.40	4.00
5/15	Menu cards..................		.25	1.00	1.25	2.00
5/17	Book covers..................		.10	1.00	1.10	1.75
5/29	Certificates..................		.76	2.86	3.62	4.50

11/16	Drilling and fitting garbage cans.	3		.75	.75	1.10
11/27	Complete woodworking vises ...		5.10	28.50	33.60	47.82
11/24	Making special bolts and nuts...		.15	1.00	1.15	1.65
"	Drilling brackets and repairing mixing valves.............			.75	.75	1.00
12/3	Surfacing pump valves........	8		.75	.75	1.10
12/9	Drilling brackets.............	8		1.00	1.00	1.50
12/31	Vises complete................	6	3.60	28.50	32.10	47.82
1916						
1/20	Drilling castings.............	24		.60	.60	.75
1/17	Pipe threaded................			.50	.50	.75
1/24	Drilling.....................			.75	.75	.75
1/25	Castings marlined............	28		2.50	2.50	3.75
1/26	Pipes drilled	36				
	Caps drilled and tapped.......	4	.30	12.50	12.80	17.50
	Springs made.................	12				
1/29	Making printing chases........	4		15.00	15.00	22.50
"	Making printing chases	5		10.00	10.00	15.00
1/31	Printing chases.	2		7.50	7.50	11.25
2/3	Railing frames drilled.........	2		1.00	1.00	1.00
2/12	Drilling flange pipes..........	4		1.75	1.75	2.40
"	Drilling stair railing...........			2.00	2.00	3.00
2/16	Turned and finished commutator	1		.75	.75	.75
3/2	Nipple-making...............	1		.75	.75	1.10
3/7	Making studs...............	2	.05	.75	.80	1.05
3/9	Making studs...............	1	.05	.50	.55	.80
3/15	Castings drilled..............	9		.50	.50	.75
3/17	Wringer repaired.............	1		1.00	1.00	1.50
3/23	Bench stops.................					
3/25	Grate-bar shaped, drilled, and fitted.....................	12	.60 2.30	3.00 7.00	3.60 9.30	4.20 12.80

TABLE V

Printing Shop Products (Froebel School)

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
9/14	Post-cards for shop service	1,000	$ .44	$ 1.04	$ 1.48	$ 7.00
9/15	Evening school enrollment cards	2,000	1.00	.78	1.78	7.00
9/20	Material and productive time sheets	5,000	2.25	2.08	4.33	28.50
"	Punching holes in sheets of paper	500		.16	.16	.50
"	"Admit" cards	2,000	1.00	1.04	2.04	7.00
"	Cards for evening school	300	1.36	1.43	2.79	9.55
9/27	Cards for medical exam. records	2,000	1.25	1.17	2.42	11.75
"	"Absent" cards—class	5,000	5.00	2.95	7.95	39.25
"	" " —district	5,000				
"	Report of relief	1,000		1.69	1.69	1.69
"	Punch repair orders	1,500				1.25
9/28	"Treatment for lice" cards	1,000	.25	.68	.93	5.00
10/1	Cover-folders of teachers' records	200	.15	1.43	1.58	2.90
"	Cash slips for café	300	.15	.78	.93	2.37
"	Monthly report cards	2,000	1.15	1.04	2.19	6.65
"	Shop orders	3,000		2.82	2.82	10.55
10/6	Deposit books	100	.20	2.86	3.06	7.00
"	Busy-work boxes	2,000	10.80	4.16	14.96	21.00
10/8	Food Commission sheets	5,000	3.50	4.16	7.66	16.85
"	Card of nationalities		.04	1.04	1.08	2.14
10/4	Monthly reports, night school			1.04	1.04	1.50

10/8	Requisitions for supplies........	1,000	.52	1.32	1.84	4.87
"	Cardboard signs for parade.....		3.31	3.64	6.95	10.00
10/11	Night school cards.	3,000	3.18	3.12	6.30	12.88
10/15	Covers for theme paper	120	1.05	.52	1.57	2.00
10/18	Vocational time cards..	2,100	.50	4.00	4.50	7.00
10/19	Permits to take printing	1,000	.45	2.60	3.05	4.20
"	Attendance cards.............	5,000	5.24	8.84	14.08	15.00
"	Tickets for Hallowe'en dance ..	200	.05	.52	.57	1.30
10/20	Punching holes..............			.52	.52	.50
10/21	O. K. cards..................	2	.07	.52	.59	.60
10/21	Permits to change classes.....	1,000	.40	1.04	1.44	3.00
10/22	Envelopes for Board of Education	2,000	5.00	1.30	6.30	8.00
10/23	Finance reports...............	500	.25	4.94	5.19	6.90
10/25	Perpetual inventories..........	500	.60	5.72	6.32	5.50
"	Library schedules.............	50	.40	2.08	2.48	3.00
10/26	Truancy affidavits	200	.20	3.38	3.58	4.40
"	Cardboard guides............	75	.06	.16	.22	.22
10/28	Dance programs..............	200	.60	2.08	2.68	3.00
10/26	Book covers.................	30	.23	.52	.75	.75
11/1	Report cards................	1,000	.50	4.68	5.18	5.18
11/3	Charge slips, cooking room......	1,000	.20	2.60	2.80	3.00
11/4	Official requisitions...........	1,000	.55	4.16	4.71	5.00
11/11	Night school advertising cards...	2,000	1.00	5.20	6.20	6.43
11/8	Line grade cards..............	300	.10	2.60	2.70	3.00
11/9	Bank-books..................	200	.40	8.32	8.72	9.12
11/15	Guide cards..................	50	.15	.10	.25	.25
11/15	Programs....................	200	.10	2.08	2.18	2.18
11/17	Entertainment cards..........	1,000	.50	3.12	3.62	4.00
"	Punching holes..............			.52	.52	.52
11/24	Programs....................	100	.06	.91	.97	1.00
"	"	500	.20	2.34	2.54	2.68

TABLE V—*Continued*

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
11/30	Statements..................	1,000	$ .25	$ 4.68	$ 4.93	$ 4.95
"	Mouth cards................	3,000	.55	11.44	11.99	12.00
12/4	Class record cards............	2,000	6.50	18.20	24.70	25.00
12/7	Mouth records...............	1,000	.25	6.24	6.49	6.50
12/11	Sheets for night school......	200	.20	2.21	2.41	2.41
12/8	Enrollment blanks............	500	.15	2.34	2.49	2.50
12/11	Class cards..................	5,000	2.00	11.44	13.44	15.00
12/13	Time cards.................	5,000	2.00	8.32	10.32	15.00
12/15	Charts of district............	100	.40	5.20	5.60	7.50
12/16	Hall order reports............	1,300	.15	2.08	2.23	3.00
"	Letterheads.................	300	.25	2.08	2.33	3.00
12/15	Programs...................	500	.15	1.56	1.71	2.00
12/17	Swimming cards.............	500	.25	2.60	2.85	3.25
12/15	Cards......................	50	.30	1.56	1.86	2.25
12/18	Programs...................	75	.15	2.60	2.75	2.80
1916						
1/6	Reports....................	500	.20	3.12	3.32	3.35
1/7	Tickets....................	1,000	.15	1.04	1.19	1.50
"	Enrollment cards............	3,000	2.00	11.44	13.44	14.35
1/3	Entertainment posters.........	500	.12	1.56	1.68	2.00
1/4	Basket-ball cards............	50	.60	1.56	2.16	2.25
1/3	"Rental list"................	1,000	.95	3.64	4.59	5.00
1/11	"Lice" cards................	500	.36	3.12	3,48	3.60
1/10	Locker records...............	5,000	2.00	7.28	9.28	9.40

1/12	Swimming posters	10	.30	1.56	1.86	1.90
"	Evening school cards	500	.35	2.60	2.95	3.25
1/13	Blotters	500	.35	4.16	4.51	4.55
	Programs	250				
1/21	School directories	500	4.00	31.20	35.20	45.00
1/25	Time cards	5,000	1.90	13.00	14.90	15.00
1/26	Classification cards	2,500	.70	4.16	4.86	5.00
2/3	Rental records	(pads) 8	.60	4.16	4.76	4.80
2/4	U. S. Gov. bills			.52	.52	.52
2/2	Absence cards	300	.14	2.60	2.74	3.00
2/1	Blotters	200	.20	2.08	2.28	2.40
2/2	Permit blanks	500	.30	3.64	3.94	4.20
2/5	Daily material and production cards	5,000	2.45	7.80	10.25	16.00
2/6	Pupils' absent, district, and word cards	12,500	6.44	18.20	24.64	38.00
2/9	Requisitions for supplies	500	.65	1.56	2.21	3.00
2/11	"Treatment of lice" in German and Polish	1,000	.15	2.08	2.23	2.70
"	Engineers' reports	4,000	2.00	4.17	6.17	10.75
2/8	Letterheads	1,000	.70	4.17	4.87	5.30
2/9	Business English notices	500	.30	2.60	2.90	3.25
2/10	Report cards	1,000	.50	2.08	2.58	3.00
2/11	Evening school course of study	500	.90	4.17	5.07	6.95
2/14	"Helper to teacher"	2,000	1.00	3.64	4.64	6.70
2/17	Class and district cards	10,000	3.80	12.48	16.28	30.00
2/14	Post-cards	59		.52	.52	1.00
2/18	Pass-books for Time Dept.	300	.30	4.17	4.47	5.00
2/19	Time checks for "School use only"	5,000	1.90	4.17	6.07	12.00
2/25	Dance tickets and programs	275	.16	1.04	1.20	1.20
2/25	Basket-ball placards	25	.14	1.04	1.18	2.00

TABLE V—*Continued*

DATE	NATURE OF WORK	QUANTITY	COST OF MATERIALS	COST OF LABOR	COST OF TOTAL	ESTIMATED MARKET VALUE
1916						
2/23	Time sheets	300	$ .30	$ 2.08	$ 2.38	$ 4.00
2/21	Evening school cards	1,500	.50	4.17	4.67	9.00
2/24	Enumeration blanks	7,000		4.17	4.17	8.00
2/23	"Treatment for lice" cards in Slavish	500	.10	2.08	2.18	2.18
2/28	Register teachers' cards	300		4.17	4.17	4.50
3/1	Night school monthly reports	2,000	3.40	8.34	11.74	13.00
3/2	Literature for mothers' meetings	1,500	.75	4.17	4.92	5.00
3/3	Beveridge school inventories	250	.17	2.08	2.25	3.00
3/4	Progress reports	1,000	.40	2.08	2.48	3.60
3/6	Grade cards	3,000	1.70	4.17	5.87	7.90
3/16	Visitors' cards	1,000	1.00	.52	1.52	4.70
3/17	Placards for evening school	50	.50	.52	1.02	2.25
"	Programs for dance	100	.50	.52	1.02	1.02
3/15	"Round Table" (school magazine)	2,000	8.16	3.65	11.81	47.41
3/15	"Round Table"	2,000	3.50	2.08	5.58	21.20
2/26	"Round Table"	2,000	7.00	4.17	11.17	49.50
3/23	Punching paper			.52	.52	.52
3/22	District and class cards	10,000	4.00	12.50	16.50	30.00
3/28	Shop cards	5,000	1.50	10.40	11.90	15.00
3/29	Age certificate			.52	.52	1.00
3/31	"Round Table"	2,000	8.16	8.33	16.49	40.00
4/1	Letterheads	1,000	1.50	1.56	3.06	3.50
4/3	"	500	.75	1.56	2.31	3.00
4/4	Billheads for shoe shop	1,000	1.00	1.56	2.56	4.50

4/18	Tickets and programs		1.50	3.12	4.62	5.00
4/17	Mothers' meeting cards		.40	2.08	2.48	3.00
4/29	Forms for doctor's laboratory		1.20	1.17	2.37	7.40
4/28	Booklet		3.60	8.33	11.93	13.15
4/26	Notes to visitors		2.75	8.33	11.08	15.15
4/29	Enumeration sheets		17.60	24.96	42.56	69.30
5/5	Programs for contest		1.00	4.16	5.16	7.00
5/10	Vocational time cards		2.00	12.50	14.50	15.00
5/20	Programs		1.50	11.44	12.94	13.50
5/16	Indiana verses			.25	.25	.25
5/22	Swimming meet		1.00	2.08	3.08	4.50
5/24	Salaries for teachers		1.10	4.17	5.27	6.30
5/25	Folders on thrift		.30	4.17	4.47	5.30
6/2	Mothers' meeting		.25	1.04	1.29	1.50
6/1	Dance programs		.25	.52	.77	1.00
6/5	Ledger pages and pass-books		.50	8.33	8.83	12.00
6/6	Swimming posters		.25	2.08	2.33	3.00
6/10	Time-keeping supplies		5.00	16.64	21.64	25.00
6/17	Tickets for play		.15	1.04	1.19	1.55
6/17	" " "		.25	3.12	3.37	4.30
6/16	" " "		.35	3.12	3.47	4.30
6/17	Programs for junior banquet		.23	.27	.50	.50
6/18	" " " prom		.23	.27	.50	.50
6/19	Tickets for gymnasium		.25	2.08	2.33	2.50
6/19	" " "		.30	3.12	3.42	3.30
6/19	Placards for play		.40	1.04	1.44	1.50
6/19	Programs		.25	2.60	2.85	3.00
6/20	Absence and school reports		7.00	4.17	11.17	30.00
6/21	Absence from class cards		.30	1.56	1.86	2.30
6/21	Graduation programs		.50	2.60	3.10	6.00
6/24	Founding of Gary		15.00	12.50	27.50	50.00

TABLE VI

Sheet Metal Shop Products

DATE	NATURE OF WORK	QUANTITY	COST OF MATERIALS	COST OF LABOR	COST OF TOTAL	ESTIMATED MARKET VALUE
1915						
9/8	Equipment for clay room		$ 1.86	$ 2.50	$ 4.36	$ 5.00
9/29	30 sheets of tin fitted to bottoms of teachers' desks..........		2.40	1.88	4.28	4.28
10/1	38ft.-6in. pipe, 2 elbows, 1 pc. tin 24 x 24 in..............		2.92	7.50	10.42	6.50
10/9	Smoke-stack on gym. at Beveridge......................		1.65	3.13	4.78	5.65
10/13	Large dust-pans.............	12	1.45	11.25	12.70	8.00
11/15	Desk-trays..................	25	5.65	14.38	20.03	13.75
"	Painters' buckets, 1 gal.......	25	4.04	11.25	15.29	6.25
11/24	Galleys.....................	14	.90	5.63	6.53	7.00
11/30	Self-watering boxes...........	17	11.80	53.13	64.93	68.00
"	Smoke-stacks and safe-thimbles (each)....................	3	5.70	18.75	24.45	16.50
12/6	Cut shingle tins.............	1,170	6.57	1.88	8.45	14.10
"	10-quart water buckets........	24	3.37	21.25	24.62	7.20
"	Shingle tins for Clarke Sta. School	1,170	5.83	2.50	8.33	11.70
12/13	16-quart scrub buckets........	25	5.65	20.00	25.65	12.50
12/15	Scrub buckets...............	12	4.00	12.50	16.50	12.00
1916						
1/15	Paper-trays.................	100	10.74	26.25	36.99	36.90
"	Picture-film boxes............	4	1.80	12.50	14.30	16.00

1/17	Desk-trays, with covers........	30	8.45	15.00	23.45	22.50
1/24	Light reflectors..............	7	.70	8.13	8.83	10.00
2/1	Mail boxes..................	50	2.50	10.63	13.13	15.00
3/4	Small covered boxes..........	40	.82	6.25	7.07	4.00
3/1	Filing boxes.................	3	.30	1.25	1.55	1.50
3/11	Typewriting-trays............	20	2.52	6.88	9.40	12.65
"	Boxes with covers...........	16	1.05	6.25	7.30	4.00
3/21	Aquarium..................		3.75	11.25	15.00	18.00
3/22	"		3.75	11.25	15.00	18.00
4/3	Dry-room, laundry............		34.83	88.75	123.58	150.00
4/15	Mail-boxes..................	30	1.45	7.50	8.95	7.50
"	Small tub....................	1	.65	5.00	5.65	5.65
	Small pails..................	3				
	Small dust-pans..............	6				
4/17	Covers for all boxes..........		.10	1.25	1.35	1.70
4/24	Pencil boxes		.35	1.25	1.60	1.95
4/25	Time-card boxes.............		1.25	2.50	3.75	4.00
3/27	Screens for domestic science dept.		3.60	2.75	6.35	6.35
5/15	Small aquarium		9.83	50.63	60.46	75.00
5/31	Roof on boys' gymnasium.....		4.15	16.88	21.03	25.75
6/10	Waste-paper baskets..........		3.50	20.63	24.13	24.13
6/5	Dust-pans....................		2.60	19.25	21.85	12.50
6/20	Sheet for desk-bottom........		2.90	2.06	4.96	5.20

TABLE VII

Plumbing Shop Products

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
9/15	Repairing closets, faucets, etc.		$ 1.50	$ 24.00	$ 25.50	$ 35.70
"	Putting sinks in clay room		22.40	33.00	55.40	75.40
9/17	Installing basin in room 212		41.25	12.00	53.25	74.67
9/22	General repair work		3.30	34.50	37.80	52.92
"	Installing basin in room 201		41.30	12.00	53.30	74.62
9/27	Cutting down playground apparatus		1.60	6.00	7.60	10.64
10/13	Repairing pool drain		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207		.15	.75	.90	1.25
"	Making alterations in physics room		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop		55.60	15.75	71.35	93.59
10/23	Installing drinking fountain in playground		72.95	30.00	102.95	144.13
11/2	Place brackets for plants		5.60	3.00	8.60	12.04
10/28	Gas line—physics room		2.50	6.00	8.50	11.90
11/3	Railing for painters' stage		4.85	3.00	7.85	10.94
11/16	Work on new laundry		59.40	30.00	89.40	139.16
11/24	Repair work		8.25	75.00	83.25	116.55
11/22	Repair toilets		.20	3.00	3.20	4.40
11/30	Shower valve		.80	12.00	12.80	17.92
12/6	Slop sink on stage		30.08	24.00	54.08	75.71
12/14	Repair work		.80	27.00	27.80	40.52

1916						
2/16	New valves in shower..........		6.50	6.00	12.50	17.50
2/7	Put gas at tables in tin shop....		13.50	12.00	25.50	35.70
2/18	Making towel racks...........		39.49	18.00	57.49	80.48
3/11	Placing shower bath, boys' locker room......................		102.06	48.75	150.81	211.20
“	Railing on job press............		6.33	12.75	19.08	26.21
1/31	Repair work................		2.20	54.00	56.20	78.68
2/28	“ “		4.35	60.00	64.35	90.24
3/31	“ “		2.60	36.00	38.60	54.04
April 3–8	General repairs..............		5.40	12.00	17.40	24.36
	Soap containers.............		32.55	27.00	59.55	83.37
	Animal cage................		10.80	6.00	16.80	23.52
10–15	General repairs..............		9.50	12.00	21.50	30.10
“	“ “		1.30	12.00	13.30	18.62
24–29	Installing wash machine........		10.10	12.00	22.10	30.94
“	Repair work.................		2.70	42.00	44.70	62.58
May 1–6	Slop sink..................		41.50	21.00	62.50	78.40
	Repair work...............		2.80	30.00	32.80	45.92
5/18	New clothes line..............		23.02	12.00	35.02	49.02
5/29	General repairs..............		5.15	70.50	75.65	102.41
5/29	New toilet rooms..............		305.90	150.00	455.90	643.80
6/15	Urinal......................		84.18	54.00	138.18	193.38

TABLE VII

PLUMBING SHOP PRODUCTS

DATE	NATURE OF WORK	QUANTITY	COST OF MATERIALS	COST OF LABOR	COST OF TOTAL	ESTIMATED MARKET VALUE
1915						
9/15	Repairing closets, faucets, etc.		$ 1.50	$ 24.00	$ 25.50	$ 35.70
"	Putting sinks in clay room		22.40	33.00	55.40	75.40
9/17	Installing basin in room 212		41.25	12.00	53.25	74.67
9/22	General repair work		3.30	34.50	37.80	52.92
"	Installing basin in room 201		41.30	12.00	53.30	74.62
9/27	Cutting down playground apparatus		1.60	6.00	7.60	10.64
10/13	Repairing pool drain		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207		.15	.75	.90	1.25
"	Making alterations in physics room		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop		55.60	15.75	71.35	93.59
10/23	Installing drinking fountain in playground		72.95	30.00	102.95	144.13
11/2	Place brackets for plants		5.60	3.00	8.60	12.04
10/28	Gas line—physics room		2.50	6.00	8.50	11.90
11/3	Railing for painters' stage		4.85	3.00	7.85	10.94
11/16	Work on new laundry		59.40	30.00	89.40	139.16
11/24	Repair work		8.25	75.00	83.25	116.55
11/22	Repair toilets		.20	3.00	3.20	4.40
11/30	Shower valve		.80	12.00	12.80	17.92
12/6	Slop sink on stage		30.08	24.00	54.08	75.71
12/14	Repair work		.80	27.00	27.80	40.52

1916						
2/16	New valves in shower..........		6.50	6.00	12.50	17.50
2/7	Put gas at tables in tin shop....		13.50	12.00	25.50	35.70
2/18	Making towel racks...........		39.49	18.00	57.49	80.48
3/11	Placing shower bath, boys' locker room......................		102.06	48.75	150.81	211.20
"	Railing on job press...........		6.83	12.75	19.08	26.21
1/31	Repair work................		2.20	54.00	56.20	78.68
2/28	" "		4.35	60.00	64.35	90.24
3/31	" "		2.60	36.00	38.60	54.04
April 3–8	General repairs..............		5.40	12.00	17.40	24.36
	Soap containers.............		32.55	27.00	59.55	83.37
	Animal cage................		10.80	6.00	16.80	23.52
10–15	General repairs..............		9.50	12.00	21.50	30.10
"	" "		1.30	12.00	13.30	18.62
24–29	Installing wash machine........		10.10	12.00	22.10	30.94
"	Repair work.................		2.70	42.00	44.70	62.58
May 1–6	Slop sink.................		41.50	21.00	62.50	78.40
	Repair work...............		2.80	30.00	32.80	45.92
5/18	New clothes line..............		23.02	12.00	35.02	49.02
5/29	General repairs..............		5.15	70.50	75.65	102.41
5/29	New toilet rooms.............		305.90	150.00	455.90	643.80
6/15	Urinal.....................		84.18	54.00	138.18	193.38

TABLE VII

Plumbing Shop Products

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
9/15	Repairing closets, faucets, etc..		$ 1.50	$ 24.00	$ 25.50	$ 35.70
"	Putting sinks in clay room....		22.40	33.00	55.40	75.40
9/17	Installing basin in room 212...		41.25	12.00	53.25	74.67
9/22	General repair work..........		3.30	34.50	37.80	52.92
"	Installing basin in room 201.....		41.30	12.00	53.30	74.62
9/27	Cutting down playground apparatus.....................		1.60	6.00	7.60	10.64
10/13	Repairing pool drain..........		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207.....		.15	.75	.90	1.25
"	Making alterations in physics room.....................		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop....		55.60	15.75	71.35	93.59
10/23	Installing drinking fountain in playground...		72.95	30.00	102.95	144.13
11/2	Place brackets for plants.......		5.60	3.00	8.60	12.04
10/28	Gas line—physics room........		2.50	6.00	8.50	11.90
11/3	Railing for painters' stage.......		4.85	3.00	7.85	10.94
11/16	Work on new laundry		59.40	30.00	89.40	139.16
11/24	Repair work.................		8.25	75.00	83.25	116.55
11/22	Repair toilets................		.20	3.00	3.20	4.40
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12/6	Slop sink on stage............		30.08	24.00	54.08	75.71
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1916						
2/16	New valves in shower		6.50	6.00	12.50	17.50
2/7	Put gas at tables in tin shop		13.50	12.00	25.50	35.70
2/18	Making towel racks		39.49	18.00	57.49	80.48
3/11	Placing shower bath, boys' locker room		102.06	48.75	150.81	211.20
"	Railing on job press		6.33	12.75	19.08	26.21
1/31	Repair work		2.20	54.00	56.20	78.68
2/28	" "		4.35	60.00	64.35	90.24
3/31	" "		2.60	36.00	38.60	54.04
April 3–8	General repairs		5.40	12.00	17.40	24.36
	Soap containers		32.55	27.00	59.55	83.37
	Animal cage		10.80	6.00	16.80	23.52
10–15	General repairs		9.50	12.00	21.50	30.10
"	" "		1.30	12.00	13.30	18.62
24–29	Installing wash machine		10.10	12.00	22.10	30.94
"	Repair work		2.70	42.00	44.70	62.58
May 1–6	Slop sink		41.50	21.00	62.50	78.40
	Repair work		2.80	30.00	32.80	45.92
5/18	New clothes line		23.02	12.00	35.02	49.02
5/29	General repairs		5.15	70.50	75.65	102.41
5/29	New toilet rooms		305.90	150.00	455.90	643.80
6/15	Urinal		84.18	54.00	138.18	193.38

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PLUMBING SHOP PRODUCTS

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			MATERIALS	LABOR	TOTAL	
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"	Installing basin in room 201		41.30	12.00	53.30	74.62
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10/13	Repairing pool drain		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207		.15	.75	.90	1.25
"	Making alterations in physics room		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop		55.60	15.75	71.35	93.59
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1/31	Repair work		2.20	54.00	56.20	78.68
2/28	" "		4.35	60.00	64.35	90.24
3/31	" "		2.60	36.00	38.60	54.04
April 3–8	General repairs		5.40	12.00	17.40	24.36
	Soap containers		32.55	27.00	59.55	83.37
	Animal cage		10.80	6.00	16.80	23.52
10–15	General repairs		9.50	12.00	21.50	30.10
"	" "		1.30	12.00	13.30	18.62
24–29	Installing wash machine		10.10	12.00	22.10	30.94
"	Repair work		2.70	42.00	44.70	62.58
May 1–6	Slop sink		41.50	21.00	62.50	78.40
	Repair work		2.80	30.00	32.80	45.92
5/18	New clothes line		23.02	12.00	35.02	49.02
5/29	General repairs		5.15	70.50	75.65	102.41
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6/15	Urinal		84.18	54.00	138.18	193.38

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Plumbing Shop Products

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
9/15	Repairing closets, faucets, etc. .		$ 1.50	$ 24.00	$ 25.50	$ 35.70
"	Putting sinks in clay room. . . .		22.40	33.00	55.40	75.40
9/17	Installing basin in room 212. . .		41.25	12.00	53.25	74.67
9/22	General repair work.		3.30	34.50	37.80	52.92
"	Installing basin in room 201.		41.30	12.00	53.30	74.62
9/27	Cutting down playground apparatus.		1.60	6.00	7.60	10.64
10/13	Repairing pool drain.		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207.		.15	.75	.90	1.25
"	Making alterations in physics room.		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop. . . .		55.60	15.75	71.35	93.59
10/23	Installing drinking fountain in playground.		72.95	30.00	102.95	144.13
11/2	Place brackets for plants.		5.60	3.00	8.60	12.04
10/28	Gas line—physics room.		2.50	6.00	8.50	11.90
11/3	Railing for painters' stage.		4.85	3.00	7.85	10.94
11/16	Work on new laundry.		59.40	30.00	89.40	139.16
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April 3-8	General repairs		5.40	12.00	17.40	24.36
	Soap containers		32.55	27.00	59.55	83.37
	Animal cage		10.80	6.00	16.80	23.52
10-15	General repairs		9.50	12.00	21.50	30.10
“	“ “		1.30	12.00	13.30	18.62
24-29	Installing wash machine		10.10	12.00	22.10	30.94
“	Repair work		2.70	42.00	44.70	62.58
May 1-6	Slop sink		41.50	21.00	62.50	78.40
	Repair work		2.80	30.00	32.80	45.92
5/18	New clothes line		23.02	12.00	35.02	49.02
5/29	General repairs		5.15	70.50	75.65	102.41
5/29	New toilet rooms		305.90	150.00	455.90	643.80
6/15	Urinal		84.18	54.00	138.18	193.38

TABLE VII

Plumbing Shop Products

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
9/15	Repairing closets, faucets, etc..		$ 1.50	$ 24.00	$ 25.50	$ 35.70
"	Putting sinks in clay room....		22.40	33.00	55.40	75.40
9/17	Installing basin in room 212...		41.25	12.00	53.25	74.67
9/22	General repair work..........		3.30	34.50	37.80	52.92
"	Installing basin in room 201.....		41.30	12.00	53.30	74.62
9/27	Cutting down playground apparatus......................		1.60	6.00	7.60	10.64
10/13	Repairing pool drain..........		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207.....		.15	.75	.90	1.25
"	Making alterations in physics room......................		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop....		55.60	15.75	71.35	93.59
10/23	Installing drinking fountain in playground................		72.95	30.00	102.95	144.13
11/2	Place brackets for plants.......		5.60	3.00	8.60	12.04
10/28	Gas line—physics room........		2.50	6.00	8.50	11.90
11/3	Railing for painters' stage......		4.85	3.00	7.85	10.94
11/16	Work on new laundry..........		59.40	30.00	89.40	139.16
11/24	Repair work..................		8.25	75.00	83.25	116.55
11/22	Repair toilets................		.20	3.00	3.20	4.40
11/30	Shower valve................		.80	12.00	12.80	17.92
12/6	Slop sink on stage............		30.08	24.00	54.08	75.71
12/14	Repair work..................		.80	27.00	27.80	40.52

1916						
2/16	New valves in shower..........		6.50	6.00	12.50	17.50
2/7	Put gas at tables in tin shop....		13.50	12.00	25.50	35.70
2/18	Making towel racks...........		39.49	18.00	57.49	80.48
3/11	Placing shower bath, boys' locker room......................		102.06	48.75	150.81	211.20
"	Railing on job press............		6.33	12.75	19.08	26.21
1/31	Repair work.................		2.20	54.00	56.20	78.68
2/28	" "		4.35	60.00	64.35	90.24
3/31	" "		2.60	36.00	38.60	54.04
	{ General repairs..............		5.40	12.00	17.40	24.36
April	{ Soap containers.............		32.55	27.00	59.55	83.37
3–8	{ Animal cage................		10.80	6.00	16.80	23.52
10–15	General repairs...............		9.50	12.00	21.50	30.10
"	" "		1.30	12.00	13.30	18.62
24–29	Installing wash machine........		10.10	12.00	22.10	30.94
"	Repair work.................		2.70	42.00	44.70	62.58
May	{ Slop sink..................		41.50	21.00	62.50	78.40
1–6	{ Repair work...............		2.80	30.00	32.80	45.92
5/18	New clothes line..............		23.02	12.00	35.02	49.02
5/29	General repairs...............		5.15	70.50	75.65	102.41
5/29	New toilet rooms..............		305.90	150.00	455.90	643.80
6/15	Urinal.......................		84.18	54.00	138.18	193.38

TABLE VII

PLUMBING SHOP PRODUCTS

DATE	NATURE OF WORK	QUANTITY	COST OF			ESTIMATED MARKET VALUE
			MATERIALS	LABOR	TOTAL	
1915						
9/15	Repairing closets, faucets, etc..		$ 1.50	$ 24.00	$ 25.50	$ 35.70
"	Putting sinks in clay room....		22.40	33.00	55.40	75.40
9/17	Installing basin in room 212...		41.25	12.00	53.25	74.67
9/22	General repair work..........		3.30	34.50	37.80	52.92
"	Installing basin in room 201.....		41.30	12.00	53.30	74.62
9/27	Cutting down playground apparatus......................		1.60	6.00	7.60	10.64
10/13	Repairing pool drain..........		1.05	4.50	5.55	7.77
10/15	Repairing toilet, room 207.....		.15	.75	.90	1.25
"	Making alterations in physics room.....................		8.25	36.00	44.25	61.95
10/18	Installing basin in paint shop....		55.60	15.75	71.35	93.59
10/23	Installing drinking fountain in playground...		72.95	30.00	102.95	144.13
11/2	Place brackets for plants.......		5.60	3.00	8.60	12.04
10/28	Gas line—physics room........		2.50	6.00	8.50	11.90
11/3	Railing for painters' stage.......		4.85	3.00	7.85	10.94
11/16	Work on new laundry..........		59.40	30.00	89.40	139.16
11/24	Repair work.................		8.25	75.00	83.25	116.55
11/22	Repair toilets...............		.20	3.00	3.20	4.40
11/30	Shower valve................		.80	12.00	12.80	17.92
12/6	Slop sink on stage............		30.08	24.00	54.08	75.71
12/14	Repair work.................		.80	27.00	27.80	40.52

FIGURE 3
PATTERNS USED IN FOUNDRY TEST
(FIFTH AND SIXTH GRADE BOYS)

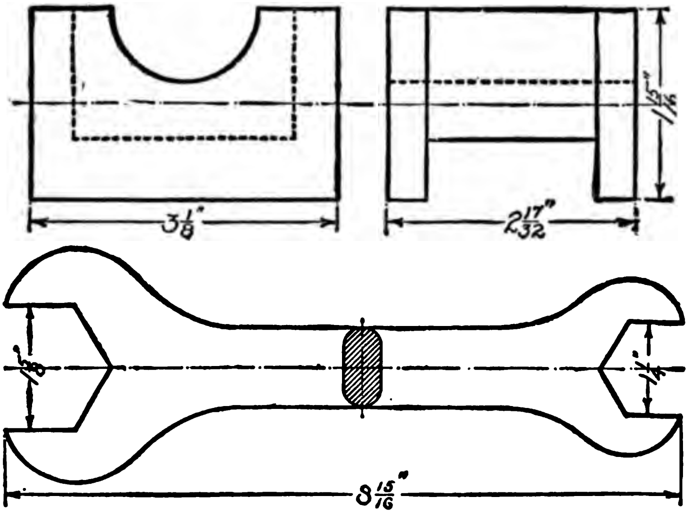
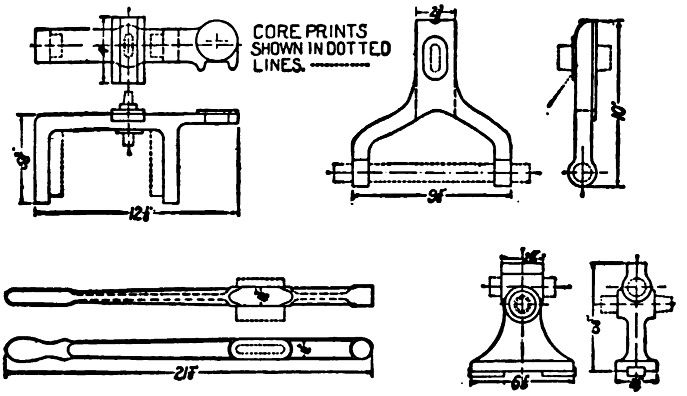


FIGURE 4
PATTERNS USED IN FOUNDRY TEST
(SEVENTH AND EIGHTH GRADE BOYS)



II. PRACTICAL TESTS

IN ORDER to present as far as possible the results of the practical tests in the several shops in concrete terms and to allow the reader to interpret the results for himself independently of the writer's comments, the age, grade, previous training, and performances of each pupil in the several tests are given.

To the same end, there is also presented each pupil's rating in the several tests. In marking pupils an arbitrary, but, it is hoped, easily understood, scale was employed, based on subtracting from a rating of 100 certain amounts for each unit deviation from the significant dimensions in the pupil's test piece. Such a scale can, of course, take account only of variations in accuracy. Certain other qualities of good workmanship, such as surface finish, cannot readily be evaluated in this fashion, and for such elements the writer has had recourse, where it seemed desirable, to word description. No ratings on the above scale basis were attempted in the case of the foundry test.

This scheme of rating makes no pretense to solve the problem of scales of measurement for industrial work, although it is possible that some suggestions may be found in this connection. One grave limitation of this particular plan lies in the fact that when a student has failed to complete any operation the scheme is not capable of satisfactorily taking the fact into account.

A. Machine Shop Test

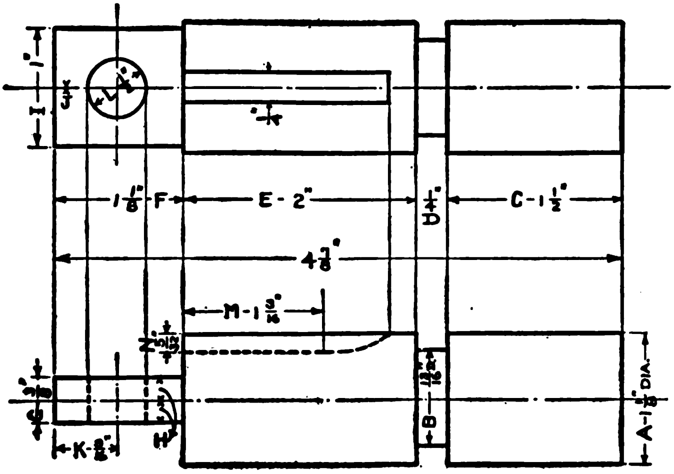
TEST AND METHOD OF SCORING

The test in machine work was held on March 16th, 17th, 18th, 20th, and 21st, five boys completing it. Each was given the drawing shown below and a piece of soft rolled steel $1\frac{1}{4}$ in. in diameter and 5 in. long.

Figure 1

Test Piece—Machine Shop

ACCURACY OF MEASUREMENT WILL BE RATED



In the case of the diameter A as turned on the lathe, each deviation of one thousandth of an inch was penalized one point. This unit was selected as an appropriate standard of workmanship for such a turned surface where a file finish is practicable and also because the students had been accustomed to using the micrometer caliper for such dimensions and to finishing such surfaces to within this limit of accuracy.

As the pupils had not been accustomed to using the micrometer caliper under conditions represented by the other dimensions, and inasmuch as such use could hardly be expected from students of this age and brief length of experience in machine work, a unit of $\frac{1}{64}$ in. was adopted in all such cases.

The width of the milled slot was not considered as a significant dimension, as this was fixed by the width of milling cutter, and the length of the full depth slot M was not penalized unless this length fell below the given dimension.

The results of the test when thus scored are given in Table VIII.

INDIVIDUAL TRAINING AND PERFORMANCES

The achievements of the individual pupils can be judged best in view of their respective age, grade in school, previous industrial training and performance in the given test. These data for each pupil are as follows:

Pupil No. 1—10th grade, age 15, fourth year in school. In machine shop since beginning of present school year. Also taking forging during same period. In forge shop two previous years for three terms each year. Had mechanical drawing for one year in eighth grade. In

TABLE VIII

RESULTS OF MACHINE SHOP TEST

PUPIL, NUMBER		1	2	3	4[1]	5
AGE		15	16	15	15	15
GRADE		10	11	9	9	9
Penalties	Significant Dimensions A	2	3	1	1	2
	B	1		1		1
	C		1	1		
	D		1	1		1
	E		2	2	2	2
	F	8	2	1	1	2
	G			1	3	1
	H	2½		½		
	I		4[2]	1	8[3]	1
	J	1	1	2	no hole	3
	K		1	2	" "	2
	L			1	" "	1
	M				" slot	
	N				" "	6
Total Penalties		14½	15	14½		22
Rating		85½	85	85½	.	78
Time	Hrs.	4	5	9	8	7
	Min.	29	27	55	42	35
Writer's Valuation		Good	Good	Good but slow	Slow worker	Fair

[1] No. 4 had no milling machine experience and could not read the drawing.

[2] Turned sides of tongue [illegible] in. diameter, [illegible] in. across flats.

[3] Left tongue as first turned 1½ in. diameter.

machine shop has been at lathe work most of the time. Has had some work at bench and on drill press, two weeks on shaper, and twice on the milling machine.

March 16th. Started 8:25. Laid out and drilled centers, dogged and placed in lathe, took heavy surface cut with high speed tool, used micrometer with finishing cuts. Stopped 9:10. March 17th. Started 8:21. Faced up one end, cut groove, calipered from end, laid out end of tongue, clamped piece vertically in shaper vise, cut down, measuring from end not faced up, reversed tool and tool post and cut second side, turned piece in vise and cut narrow sides. Finished shaper work 10:48 and started on milling machine, set up correctly, did not oil cutter, did not know this was necessary, gauged depth of cut by index wheel on elevating screw. Finished cutting slot 11:25 and drilled hole. Finished with file in lathe 12:05. Total time, 4 hrs. 29 min. Had not machined one end.

Pupil No. 2.—11th grade, age 16, third year in school. Machine shop since beginning of school year, also all of previous year, and half of year 1913–14. Taking mechanical drawing this year since beginning. In machine shop has had whole range of tools.

March 16th. Started 11:15. Laid out and drilled centers, dogged, placed in lathe, sharpened high speed cutting tool, faced up one end, took surface cuts, using micrometer in finishing, faced up other end but did not measure for length, cut groove measuring with scale from end. Stopped 12:09. March 17th. Started 11:19.

Doubtful whether tongue should be curved or flat on narrow sides, finally turned end down to 1 in. diameter. Stopped 12:10. Resumed 1:17. Placed piece in shaper vise horizontally on parallel, took out and drew center line on end and then described circles ⅜ in. in diameter with dividers, centering on this line, used power feed for cut. Stopped 2:14. March 21st. Started 11:15. Continued work on shaper. Stopped 12 o'clock. Resumed 1:15. Finished work on shaper, set up work on milling machine, centered correctly, used index wheel on elevating screw to gauge depth of slot, drilled hole centering carefully. Finished 3:15. Total time, 5 hrs. 27 min.

Pupil No. 3.—9th grade, age 15, first year in school. Machine shop since beginning of the school year. No mechanical drawing in Emerson school. Two years of manual training and drawing previously in Chicago public school. In machine shop has had work on drill press and shaper, three weeks on lathe, and twice on milling machine.

March 17. Started 1:17. Laid out and drilled centers, dogged, placed in lathe, faced up one end, reversed and faced other end, but did not measure length, had some difficulty in setting high speed cutting tool, finally adjusted correctly and took surface cuts, using micrometer, cut groove, measuring position by scale, laid out end for cutting tongue, clamped in shaper and took first cut. Stopped 4:15. March 18th. Started 7:45. Clamped in shaper vise for second cut on parallels, end pieces did not quite come up to flat, used level, cuts turned out not parallel, tried to adjust by using level. Stopped at 11:22. March 20th. Started 9:40. Finished narrow sides of end on shaper at 10:30, set up piece on milling machine, used great care in centering cutter, found decimal equivalent of depth of slot, and gauged cut by index wheel on elevating screw, completed slot 11:50; laid out for drilling hole, used much care in centering drill, found drill was out of true, corrected by taking sleeves apart and truing, completed hole 12:35; placed piece in lathe and file finished to micrometer size. Finished 1 o'clock. Total time, 9 hrs. 55 min.

Pupil No. 4.—9th grade, age 15, one year in school. In machine shop since beginning of school year, no mechanical drawing. Machine shop experience, benchwork, lathe, drill and shaper.

March 17th. Started 2:25. Laid out and drilled centers, dogged, placed in lathe, took surface cuts with high speed cutting tool using micrometer for the finish cuts. Stopped 3.12. March 18th. Started 9:30. Cut groove, measuring by scale from end; found great difficulty in interpreting drawing of tongue end, necessary to explain. Stopped 11.30. March 20th. Started 2 o'clock. Set up in lathe again and faced ends to length, laid off center line on end and mounted horizontally in shaper vise, measured length of tongue with scale, took very light cut and worked very slowly. Stopped at 4:20. March 21st. Started 1:35. Continued work of cutting flat sides of tongue on shaper. Stopped 4:25. Resumed 7:30. Finished flat sides, left narrow sides as turned. Stopped 8:15. Total time, 8 hrs. 42 min. No slot, no hole.

Pupil No. 5.—9th grade, age 15, third year in school. Had had five terms of machine shop, one term foundry, one term manual training woodwork, and one term of mechanical drawing. In machine shop had had full range of work.

March 17th. Started 2:30. Laid out and drilled centers, dogged, placed in large lathe, surfaced one end with high speed cutting tool, then faced end, reversed and faced other end and completed surface cut, using micrometer, cut groove, calipering position from end. Stopped 4:25. March 18th. Started 11:35. Laid out parallel lines on end for cutting tongue, clamped in vise horizontally, cut one flat, reversed and bedded piece in vise on parallel from which he shimmed up to flat cut. Stopped 12 o'clock. Resumed 1:05. Finished flat cuts and shoulders. Stopped 3 o'clock. March 20th. Started 9:10. Set up piece in milling machine, adjusted so as to bring cutter central, gauged depth of cut by index wheel on elevating screw, went back to shaper and cut narrow sides, setting piece by try-square. Stopped 11:50. Resumed 2:25. Started to drill hole, found bed of drill was not level, tested with level and adjusted bed, supported outer end of piece as well as flat tongue, completed hole at 3:05; found that hole was off center owing to faulty drill point. Total time, 7 hrs. 35 min.

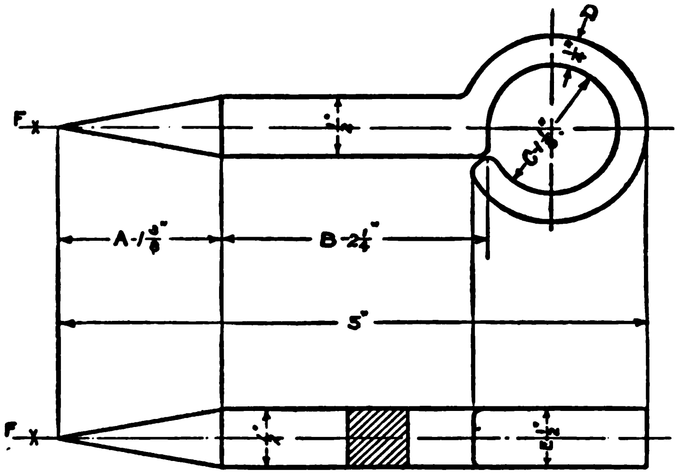
B. Forge Test

TEST AND METHOD OF SCORING

The forge shop test was held on March 16th and 17th. Ten boys completed the test. Each boy was given the drawing shown below, and a piece of ½ in. square wrought iron stock.

Figure 2
Test Piece—Forge Shop

FINISH AND ACCURACY OF MEASUREMENT WILL BE RATED



One thirty-second of an inch was adopted as the unit measurement in the forge shop test and one point was deducted for each unit deviation from the lettered dimensions in the above drawing.

RESULTS OF TEST

The results of the test when thus scored are given below:

TABLE IX

Results of Forge Test

Pupil, Number		1	2	3	4	5	6	7	8	9	10
Age		14	15	14	13	15	13	14	14	14	14
Grade		8C	8C	8C	8C	8A	8A	9	9	9B	10
Penalties — Significant Dimensions	A			6	4				4	4	8
	B	4			8		2	4	8	2	
	C	6	2	2	4	4	4	8	4	2	6
	D	4	2	2	2	2	4	4	2	2	2
	E	3	2			1	2	2	3	2	2
	F	5	2	2	1	2	3	3	1	2	1
Total Penalties		22	8	12	19	9	15	21	22	14	19
Rating		78	92	88	81	91	85	79	78	86	81
Finish		Good to fair	Good	Good	Good	Burned at ring	Cap burned at ring	Poor	Good	Fair	Good
Point		Sharp	Sharp	$\frac{1}{16}$" wide	$\frac{3}{32}$" wide	$\frac{3}{32}$" wide	$\frac{1}{8}$" wide	$\frac{3}{32}$" wide	$\frac{1}{16}$" wide	$\frac{1}{16}$" wide	Sharp
Hole		Regular	Smooth & regular	Smooth fairly regular	Regular	Fairly regular	Irregular	Irregular	Regular	Smooth	Smooth & regular
Shoulder		Fair	Good	Much rounded	Fair	Good	Poor	Very poor	Fair	Fair	Good
Time	Hrs.	3.	3	3	3	3	2	2	1	1	
	Min.	24		23	20	42	35	35	45	40	55
Writer's Valuation		Fair	Very Good	Good	Fair	Fair to Good	Poor	Very Poor	Fair	Fair	Good

INDIVIDUAL TRAINING AND PERFORMANCES

The individual performances, together with age, grade in school, and shop experiences, are noted below. The first four boys started the test at 8:15 and worked until 10:15 on March 16th; the remainder started at 11:15 and worked until 12:15. Both groups finished the following day.

Each boy of the two groups made frequent measurements with calipers and scale while working his metal. His main interest seemed to be to make correct dimensions. The boys paid little attention to the scale that dropped on the anvil. Some of the anvils were in very poor shape, making it necessary to exchange when certain parts of work were being carried out. The condition of the anvils was a handicap to the boys in working their pieces.

Pupil No. 1.—8th grade, age 14, in forge shop since December. Had had foundry experience. He was the first boy to decide that he needed three and a half inches of stock to make the eye. All the other boys followed his lead in this matter. He was the first boy to put the work in the fire and the first to start drawing out thickness for the eye. He did not know the relation of the circumference to the diameter; dimension of three and a half inches was the result of a rough measurement around the eye. He drew his stock out and cut off the surplus at 9:24. He was the second boy to bend the eye at 9:40, but opened it up again to perfect the thickness. Very particular as to his measurements. Worked 1 hr. 24 min. on March 17th. Total time, 3 hrs. 24 min.

Pupil No. 2.—8th grade, age 15. Was the largest and heaviest boy in the class. He was repeating his term of forge work. He had had wood turning, pattern making, and drawing. He worked rapidly and was more or less of a leader for the other boys. They followed his example in using the fuller. He worked faster than the others. He cracked the part he had drawn to a point. Without asking a question, he went into the foundry, got some sand and attempted to weld the crack. After several unsuccessful attempts, he asked for the privilege of starting another. He took another piece, drew it and closed the eye at 9:45. Worked 1 hr. March 17th. Total time, 3 hrs.

Pupil No. 3.—8th grade, age 14, in forge shop since December. He had had wood turning, foundry, sheet metal work, pattern making, and mechanical drawing. He was the third boy to put the work in the fire and the third to start drawing out. He kept a slow fire and worked his metal rather cold. He cut off the surplus at 9:15. He was the first to finish the eye at 9:30. He had rather overworked the material. Worked 1 hr. 23 min. March 17th. Total time, 3 hrs. 23 min.

Pupil No. 4.—8th grade, age 13, in forge shop since December 15th. Had had foundry work and painting. He was the fourth boy of the group to put his work in the fire, following the example of the boy next to him. He laid off the length to be allowed for forming the eye as three and a half inches. He was the fourth boy to use the fuller to start the reduction of the thickness of the metal. He assisted other boys in using this tool, was quite direct in his work, kept a good live fire, and made good use of his heats. He drew out the thickness of the metal and cut out the surplus at 9:25. Bent the eye. He was not satisfied because thickness was not uniform and finish was not good. He aimed at close measurements. He reheated it, opened up eye, and tried it over. He showed a tendency to overwork his stock. At the close of the period, 10:15, he asked for the privilege of starting a new one the next day. Made another piece on March 17th. Total time, 3 hrs. 20 min.

Pupil No. 5.—8th grade, age 15, had completed four terms in forge shop. He had had no other shop experience but had taken mechanical drawing. He began with making the point rather than the eye, following the example of No. 10, who seemed to be the leader of this group. Each boy laid out the dimensions for the point, shank, and stock to be allowed for the eye by marking with a quick punch. Finished making the point at 11:50. He used the "flatter" for drawing out the stock for the eye. He renewed the test March 17th at 11:15. Kept an unclean fire and was inclined to be lazy; he would hold the "flatter" and let a small boy wield the sledge. After taking up considerable time from the other boys, he was finally told to draw his stock down with his hammer. He was a poor worker. On the first day he cut the point off twice. Worked 1 hr. 42 min. on March 17th. Total time, 3 hrs. 42 min.

Pupil No. 6.—8th grade, age 13, was completing the third term in forging. He had worked in the school bank and mechanical drawing. He was very careful in making the point. Completed this at 12:15. He was told to assist No. 5 in using the "flatter" with sledge. Received very little help in return, did most of his drawing without the hammer, did not complete the eye at this hour. Worked 1 hr. 35 min. on March 17th. Total time, 2 hrs. 35 min.

Pupil No. 7.—9th grade, age 14, in forge shop since December, 1915. He was very small and light. He had had foundry work and mechanical drawing. He made the point first, got it too long, and cut it off several times, finished the point at the close of the hour. He was careful, but very slow. Worked 1 hr. 35 min. March 17th. Total time, 2 hrs. 35 min.

Pupil No. 8.—8th grade, age 14, had three terms of forge work. He had had painting, printing, and mechanical drawing. He made the point first. He worked very directly and finished the point at 11:35 and started to help No. 10 with the "flatter." He made an estimate of four and a half inches of stock needed for making the eye. March 17th, he completed the drawing out, had difficulty in getting proper length of stock for the eye and cut it off several times, then filed the end to get the proper length for the eye. He completed the piece at 12 o'clock. Total time, 1 hr. 45 min.

Each of the seventh and eighth grade boys was given a pattern requiring a core. Four of these patterns are shown in Figure 4. There were two others of similar character. Some of the patterns were halved and some were solid, requiring a waste bed in the cope. Castings in lead were made from each of the finished molds.

RESULTS OF TEST

From the nature of the case measurement ratings are not a competent basis for the valuation of results in the foundry. For an exposition of these results the writer has been obliged to rely upon the description of each boy's approach to his work, the steps pursued, and time consumed in making the molds and the quality of the resultant casting. With all these considerations taken into account, the writer has then given his own valuation of the quality of the performance. These are summarized in Table X.

INDUSTRIAL TRAINING AND PERFORMANCES

Pupil No. 1.—5A grade, age 11, one term of mechanical drawing, three terms of blacksmithing, and now in third term of foundry.

Molding: Half box and wrench. Started 10:15. Placed patterns on mold board, sifted, rammed drag, turned drag, cut out for wrench, sanded, placed gate plug, sifted and rammed cope, lifted cope, wet edges, drew patterns. Careful, orderly work, done without

TABLE X

Results of Foundry Test

Pupil, Number	1	2	3	4	5	6	7	8	9	10
Grade	5	5	5	5	5	6	6	6	6	6
Age	11	11	12	10	12	11	14	11	11	10
Time (Min.)	44	36	32	31	28	34	50	33	51	65
Writer's Valuation	Good	Poor	Good	Fair	Good	Very good	Poor	Very good	Fair	Failure

Pupil, Number	11	12	13	14	15	16	17	18	19	20	21
Grade	7	7	7	7	7	7	8	8	8	8	8
Age	12	15	11	14	14	13	13	13	12	12	14
Time { Hrs. Min.	2 2	2 13	1 43	1 55		1 50	1 40	1 49	2 5	1 55	2 0
Writer's Valuation	Poor	Fair	Good	Good	Fail-ure	[1] Probably fair to good	Good	Very Good	Very good	Very good	Very good

---

[1] Mold closed by instructor in wrong position.

Each of the seventh and eighth grade boys was given a pattern requiring a core. Four of these patterns are shown in Figure 4. There were two others of similar character. Some of the patterns were halved and some were solid, requiring a waste bed in the cope. Castings in lead were made from each of the finished molds.

RESULTS OF TEST

From the nature of the case measurement ratings are not a competent basis for the valuation of results in the foundry. For an exposition of these results the writer has been obliged to rely upon the description of each boy's approach to his work, the steps pursued, and time consumed in making the molds and the quality of the resultant casting. With all these considerations taken into account, the writer has then given his own valuation of the quality of the performance. These are summarized in Table X.

INDUSTRIAL TRAINING AND PERFORMANCES

Pupil No. 1.—5A grade, age 11, one term of mechanical drawing, three terms of blacksmithing, and now in third term of foundry.

Molding: Half box and wrench. Started 10:15. Placed patterns on mold board, sifted, rammed drag, turned drag, cut out for wrench, sanded, placed gate plug, sifted and rammed cope, lifted cope, wet edges, drew patterns. Careful, orderly work, done without

TABLE X

Results of Foundry Test

Pupil, Number	1	2	3	4	5	6	7	8	9	10
Grade	5	5	5	5	5	6	6	6	6	6
Age	11	11	12	10	12	11	14	11	11	10
Time (Min.)	44	36	32	31	28	34	50	33	51	65
Writer's Valuation	Good	Poor	Good	Fair	Good	Very good	Poor	Very good	Fair	Failure

Pupil, Number	11	12	13	14	15	16	17	18	19	20	21
Grade	7	7	7	7	7	7	8	8	8	8	8
Age	12	15	11	14	14	13	13	13	12	12	14
Time { Hrs. Min.	2 2	2 13	1 43	1 55		1 50	1 40	1 49	2 5	1 55	2 0
Writer's Valuation	Poor	Fair	Good	Good	Failure	[1] Probably fair to good	Good	Very Good	Very good	Very good	Very good

[1] Mold closed by instructor in wrong position.

waste motion. Drew patterns admirably. Very little patching and that well done. Put mold together well and cleaned up conscientiously. Finished work 10:59. Total time, 44 min.

Castings: Wrench very good, ends very clean. Box broken a little at bottom of flange, otherwise very good; clean surfaces.

Pupil No. 2.—5A grade, age 11, had one half term of blacksmithing, three weeks of poultry, and three terms of foundry.

Molding: Half box and wrench. Started 10:16. Placed patterns on mold board, sifted, rammed up drag, turned drag, cut out for wrench, sanded properly, placed gate well. Sifted, rammed cope too soft. Insisted on doing it over. Lifted cope and wet edges. Drew patterns without sufficient tapping and without as much care as he had displayed in other work. Poor patching. Finished 10:52. Total time, 36 min.

Castings: Poor. Box mold broken badly at gate, bottom flange rough on one side. Wrench badly formed, ends very rough, surface not clean.

Pupil No. 3.—5th grade, age 12, now in first term of foundry. Has had two terms of forging, but no mechanical drawing.

Molding: Half box and wrench. Started 8:30. Arranged patterns in drag on mold board, did not know name of this part of flask—called it bottom; knew name of cope. Sifted molding sand on top of patterns and rammed. Turned drag, cut out for curved side of wrench and box. Sanded and placed gate plug properly. Sifted and rammed cope, and lifted same. Did not wet edges before drawing patterns. Cut gate and sifted charcoal. Closed mold 9:02. Quick and skillful worker. Total time, 32 min.

Castings: Wrench very good. Box very good; one corner at bottom of flange slightly broken.

Pupil No. 4.—5th grade, age 10, now in second term of foundry. Has had one term of forging, one of printing, and one of mechanical drawing.

Molding: Half box and wrench. Started with patterns on mold board at 8:30. Rammed, turned, sanded, placed cope and gate plug. Sifted cope, rammed, lifted cope 8:49. Side of wrench mold broken a little; patched, wet edges, drew patterns. Sifted charcoal and closed mold 9:01. Time, 31 min. Not very skillful.

Castings: Wrench had heavy fins at parting. Box had one rather bad break at parting.

Pupil No. 5.—5th grade, age 12, now in second term of foundry. Is also taking forging this term. Has had one term of mechanical drawing.

Molding: Half box and wrench. Started 8:30 with patterns on mold board. Sifted and rammed, placed cope and gate plug 8:42; lifted cope, wet edges, and drew patterns 8:50; wrench mold had sides a little broken; box clean. Sifted charcoal and closed mold 8:58. Total time, 28 min. Worked rapidly and intelligently.

Castings: Wrench had rather large fin. Box very good.

Pupil No. 6.—6C grade, age 11, has had one term of foundry, is now in his second. Is also having his first term of mechanical drawing. First year in the Gary schools.

Molding: Half box and wrench. Started 11:16. Placed patterns on mold board, sifted sand, and rammed drag. Turned drag, cut out for wrench, sanded and placed gate plug. Sifted and rammed cope, lifted cope, wet edges, drew pattern. Worked on his mold slowly and carefully. Took steps in proper order. Made gates rather small. Finished 11:50. Total time, 34 min.

Castings: Excellent, with slight fins, but very good surface.

Pupil No. 7.—6A grade, age 14, has had one term of printing, is now in his first term of foundry, and first term of mechanical drawing.

Molding: Half box and wrench. Started 11:17. Placed patterns on mold board, sifted sand, and rammed drag. Turned drag, cut out for wrench, sanded, placed gate plug. Sifted and rammed cope. Lifted cope, drew patterns. Did not wet edges. Put mold up in regular order, but work was slovenly. Drew pattern carelessly, necessitating some patching, not very well done. Finished 12:07. Total time, 50 min. Over-age, backward pupil.

Castings: Wrench had strong fins, surface rough. Bottom and side of flange quite rough, some snags.

Pupil No. 8.—6A grade, age 11, has had one term of printing this year and is in his first term of foundry.

Molding: Half box and wrench. Started 11:17.

Placed pattern properly on mold board, sifted sand and rammed drag. Turned drag, cut out for wrench, sanded and placed gate plug, sifted and rammed cope. Lifted cope, wet edges, drew pattern. Cut gate and cleaned up in a careful manner. Rapid, orderly, and intelligent worker. Finished 11:50. Total time, 33 min. Unusually mature boy for his age.

Castings: Excellent on the whole. Slight sand marks on wrench. Box flange and corners a bit broken. Clean ends to wrench, with very slight fins.

Pupil No. 9.—6C grade, age 11, has had one term of poultry, three terms of mechanical drawing, one term of tin shop, and now in first term of foundry.

Molding: Half box and wrench. Started 11:18. Patterns placed for him by instructor, who afterward told him to do the mold over again as they were placed too near. Took steps in making mold in good order and placed gate well. Mold did not part well, necessitating re-ramming of cope. Drew patterns poorly. His whole effort indicated that he had worked at molding but a short time and was not sure of himself. Finished 12:09. Total time, 51 min. Boy was small, undersized, and nervous. Tried very hard.

Castings: Wrench had good surfaces and small fins. Bottom of flange badly broken and filled. Bottom surface rough.

Pupil No. 10.—6th grade, age 10, has had one term foundry, one term pattern shop, and one term mechanical drawing.

Molding: Half box and wrench. Started 11:15. Very rough worker. Placed patterns on mold board, sifted, rammed, several failures when turning drag. 11:50, still working on drag. Cope lifted 11:57. Drew patterns. Break in sand. After spending a long time over patching, instructor at 12:20 told him to quit. Failure. Possibly might have produced a result in time.

Pupil No. 11.—7A grade, age 12, has had six thirteen week terms of foundry, two terms of freehand drawing, but no mechanical drawing.

Molding: Started 8:30. Made his core with wires set too low. Recognized that mistake had been made through thoughtlessness. Overhaste led to laying core out on wrong side; had to make core over three times in all. Failures and mistakes had effect of calming him down and finally cores were carefully and well made. Understands composition of core sand and purposes and use of cores.

Did not place patterns particularly well on drag mold board, due in part to haste. Sifted and rammed up fairly well, but with much wasted motion. Turned drag. Applied more parting sand than was necessary. Much puzzled over placing of gate. Placed wrong, although half realized that he was doing so at the time. Sifted and rammed cope, lifted cope. Rapped and drew pattern carefully. Filed core off and ventilated. Placed core carefully, and closed mold. Finished 10:32. Total time, 2 hrs. 2 min.

Castings: Sunk on account of poor placement of gate.

Halves not quite in line. Both castings had fairly smooth surfaces.

Pupil No. 12.—7A grade, age 15, has had one term of poultry and one term of freehand drawing. Present term is the only foundry experience he has had.

Molding: Started 9:18. Made four cores in rather careless fashion, breaking two. Wasted considerable time.

Halved pattern with cores. Placed half pattern on mold board, sifted, rammed drag, turned, placed other half pattern, placed cope, forgot parting sand. Rammed up cope too soft so that it broke when parted. Much better on second attempt. Put mold together without cores which he had previously made, but which he forgot to place, due to carelessness. Started to make entire mold over again, but did not finish in time for pouring. Left 11:15. Resumed 1:18. Finished 1:34. Total time, 2 hrs. 13 min. Rather careless and indifferent worker.

Casting: Good except halves not well centered, owing to loose pins on flask.

Pupil No. 13.—7A grade, age 11, has had one term of poultry, one term of storeroom, and one term of mechanical drawing. At present is in fifth term of foundry work.

Molding: Solid pattern with core. Started 8:32. Gathered tools and materials quickly and carefully. Took steps in proper order. Made false cope, placed pattern, rammed drag, threw away false cope and rammed finished cope. Did not ram quite hard enough, with result that mold broke on edges. When questioned he indicated by his answers that he understood the reasons for his difficulties. Asked what he thought he had better do, after a moment's pause, he decided to patch the mold rather than to make it over. Used too much water in patching. When finished he remarked that he could have rammed new cope in less time than it took to patch. Drew patterns from drag carefully and well. Finished 10:15. Total time, 1 hr. 43 min.

At first somewhat careless about backing core. More careful with the second half and turned out his cores unbroken. Completed four cores in 35 minutes, baked and filed for venting, pasted and placed in mold, and remarked while doing it that he had never known the importance of venting a core.

Casting: Good, slight fin at parting.

Pupil No. 14.—7th grade, age 14, one term foundry, one term forge, but no mechanical drawing.

Molding: Solid pattern of long lever. Started 10:20 and made core very well after several failures. Made waste bed for long lever in cope, placed drag and rammed, reversed and cut out in drag, placed cope and rammed, drew cope clean except in one spot. Drew patterns from drag, mold broke a little at core print end. No previous experience with cores. Finished mold 12:10. Placed cores at 2:15–2:20. Total time, 1 hr. 55 min.

Casting: Side of core rough, rest very clean.

Pupil No. 15.—7C grade, age 14, one term foundry, one term printing, one term forge, but no mechanical drawing.

Molding: Started 10:15. Commenced to make finished bed in cope instead of waste bed for yoke pattern. Used up much time making parting so as to draw. Put on drag, rammed, drew. Drag fell out. Tried again, finished with drag on top. Drew large piece of sand with pattern. Instructor then rapped and drew pattern. Long time mending, very poor surface. Instructor told him to throw out his drag 11:40. Failure.

Pupil No. 16.—7C grade, age 13, three terms foundry, two weeks forge, and one term mechanical drawing.

Molding: Pattern with plate core. Started 10:20 to make core, in which he succeeded after considerable time and several failures. Placed half pattern on drag, sifted and rammed. Turned, placed other half pattern, sanded, placed gate plug, sifted, and rammed cope. Lifted cope and drew pattern. Finished 12:10. Total time, 1 hr. 50 min. Cores placed by instructor 2:15, who put cope on in reversed position.

Casting: Spoiled. The two halves showed clean.

Pupil No. 17.—8A grade, age 13, one term of printing, two of pattern making, one of tin shop, one of freehand drawing, one of mechanical drawing, and two of storeroom. Has had one term of foundry work and is now in his second.

Molding: Started 8:30. Instructor placed patterns on mold board. Pupil sifted sand, rammed, turned drag, placed other half of pattern, placed cope, placed gate plug, sifted and rammed, lifted cope. Rapid and thoughtful worker. Performed all operations correctly and rapidly, but was obliged to make cope over because of break. Succeeded in second attempt. Drew patterns carefully. Gate well made. Made cores carefully and was successful in first effort. Finished 10:10. Total time, 1 hr. 40 min.

Casting: Good surface. True, small fins.

Pupil No. 18.—8A grade, age 13, one term of poultry, one term of mechanical drawing, and six weeks of forging. Is in his third term of foundry work.

Molding: Started 10:16 and succeeded very well in making his core. Made waste bed in cope and placed pattern, set drag, sifted sand and rammed. Turned drag, cut out for side of pattern, sanded, placed cope, placed gate plug properly. Sifted molding sand and rammed cope. Lifted cope, and wet edges. Mold well put together and in an orderly manner. Patterns well placed and well drawn, with little and careful rapping. Placed cores. Finished 12:05. Total time, 1 hr. 49 min. Rapid and intelligent worker.

Casting: Very good. One side slightly rough.

Pupil No. 19.—8th grade, age 12, three terms in foundry, one in forge, and one in mechanical drawing.

Molding: Halved pattern with side flange. Started 9:15. Made cores without mistakes and succeeded in first attempts. 9:40 started on mold, half pattern in drag. Rammed, turned, 9:43 sanded, blew clean, placed and rammed cope, gate plug well placed, raised cope, wet, cut gates, charcoal. Stopped off upper core prints for which no cores were made. Left 11:15 without putting in cores. Placed these 2:15–2:20. Very good and careful workman. Total time, 2 hrs. 5 min.

Casting: Very true and clean.

Pupil No. 20.—8th grade, age 12, three terms foundry, one term sheet metal, one printing, and one mechanical drawing.

Molding: Halved pattern with core. Started 9:15. Made cores carefully and successfully with only two failures. Started 9:40 with half pattern on mold board. Rammed, turned, sanded, placed cope, rammed, lifted, brushed, wet edges, and drew patterns. Very clean mold. Placed core and finished at 11:10. Total time, 1 hr. 55 min. Careful and thoughtful worker.

Casting: Very good, clean, and true.

Pupil No. 21.—8th grade, age 14, one term foundry, seven weeks machine shop, one term mechanical drawing and one term poultry.

Molding: Deep solid pattern. Started 10:20 making cores. Finished these successfully with but few failures. Rammed drag of deep flask, turned, cut down for parting, sanded, placed cope and gate plug, sifted and rammed cope. Lifted cope and drew pattern carefully. Finished mold 12:15. Placed cores 2:15–2:20. Total time, 2 hrs. Skillful and intelligent worker.

Casting: Very good, sharp corners, and clean and true surfaces.

D. Printing Test

TEST AND METHODS OF SCORING

The printing test was as follows:

Directions—The copy below is to be printed on a card 3½ in. x 5½ in. You are to use your own judgment as to type, margins, and arrangement.

Copy

Public Schools
Gary, Indiana
__________191___.

Mr.________________

I regret to inform you that__________came late to school this__________. This is the __________ time he has been tardy.

Will you coöperate with the school in training your child to be punctual?

The school hours for__________ are as follows: __________a. m. to ________ m; and ________ p. m. to ________ p. m.

Please sign and return.

____
Principal.

____
Parent's Signature.

In rating the printing test it was found impracticable to develop a satisfactory scale of measurements on the point subtraction basis. Instead, a certain value in percentage was assigned to each of four considerations—accuracy in following copy, justification, use of leads, and artistic arrangement—and the performance was rated under these heads according to the success attained.

The results of the tests when thus rated are given in Table XI.

INDIVIDUAL TRAINING AND PERFORMANCES

The test was made at the Emerson school March 16th and 17th. On the first day, at 10:15, each pupil was handed a copy of the test. Each showed surprise at this manner of having a job presented. One girl said she did not see any sense in doing it and said she was not going to do so, but after a minute's hesitation, went on with it as did the others.

A detailed description of the performances of the Emerson school pupils follows:

Pupil No. 1.—9th grade, age 16, cooking one term, mechanical drawing one term, printing one term.

She looked at the sheet of directions and copy, asked if she was to set up the "directions" as well as the copy, took 4½ in. as the length of the line to go on a 5½ in. card, wanted to know how many leads should go between the lines, did not seem to be acquainted with the point system, but knew the case. By 11 o'clock she had seven lines set up. Stopped at 11:15.

Resumed at 10:15, March 17th. When her stick was full, asked the instructor to help her "dump" it as she had never done this. She noticed that the spacing of

TABLE XI

RESULTS OF PRINTING TEST

PUPIL, NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Age	16	14	14	14	16	14	15	14	14	15	12	14	14	15	13	13
Grade	9	9	9	9	9	9	9	9	9	9	9	10	9	10	9	9
Accuracy in following copy 40% Punctuation 10 Spelling 20 Capitalization 10	35	40	40	40	39	40	40	40	40	40	40	30	30	38	40	38
Justification 20%	15	17	18	18	18	15	15	20	20	10	18	10	18	17	10	15
Use of leads as to length and position 20%	18	16	16	18	15	15	18	15	20	15	10	10	17	18	15	20
Artistic arrangement 20% as to Judgment of margin Selection of type Display of heading	18	18	17	15	15	18	16	18	17	10	18	18	18	17	17	18
Rating	86	91	91	91	87	88	89	93	97	75	86	68	83	90	82	91
Time Hrs.	2+	2+	2+	2+	2	3	3	2	3	3	3	3	3	2	2	2
Time Min.					15			25		5	17	7	22	45	42	17
Writer's Valuation	Good	Good	Good	Good	Good	Good	Good	Good	Very good	Fair	Good	Poor	Fair	Good	Fair	Good

her matter was too great and reduced it by replacing the slugs. Before her proof was taken, said "I am through, but I have made a mistake." The instructor suggested that she make the correction. Instructor took proof 11:15.

Pupil No. 2.—9th grade, age 14, cooking, sewing, and mechanical drawing.

She took the copy, looked it over carefully, and set her stick at 26 picas. Couldn't tell definitely why she took this measurement, simply stated that she thought that it would leave enough margin, worked ahead without question, chose her dotted rule and had six and a half lines completed at 11 o'clock. Stopped at 11:15.

Resumed 10:15, March 17th. Asked the instructor to empty her stick at 11:05 when the last of the lines was set up. She tied up her work in the galley herself ready for the proof at 11:20. Instructor took proof.

Pupil No. 3.—9th grade, age 14, sewing, mechanical drawing, and one term printing.

She did not seem to be any better acquainted with the work than the others. She set her stick at thirty picas, but could give no reason why. This left a very slight margin for a five and a half inch card. (There are six picas to the inch.) She knew the case and did not seem to have any difficulty with setting up the dotted rule; had five and a half lines completed at 11 o'clock. Stopped 11:15.

Resumed 10:15, March 17th. She set up all of the dotted rule available and was told to use lead leaders which have a different style of dot. She objected and said that it would not look right to use two kinds of dots. Stopped at 11:15. Came back later and completed work. Instructor took proof.

Pupil No. 4.—9th grade, age 14, in pattern making department three months, had had mechanical drawing, and had been in the print shop four terms.

Asked "What type shall I use?" and then proposed that he draw a card the size of dimensions given and estimate how much margin he should allow. He seemed to be familiar with the use of the stick; set his type quickly, and made few errors. Worked by himself and had little to say. By 11 o'clock he had eight lines set up. Stopped at 11:15.

Resumed 10:15, March 17th. He started new stick, completed his lines and made corrections by 11 o'clock. He took the material out of the stick and placed it on stone instead of galley. The instructor suggested his using the galley and he then placed it in the galley ready for proof. Took proof 11:15. He did not seem to be well acquainted with the point system but rather set his stick by measurement.

He was the only one who could take his material out of the stick and tie it up for a proof. The girls needed assistance in this respect. None of them had any idea of laying out the job either by the point system or by drawing the size of the card, nor did they develop a plan to determine the length of the lines.

The corrections were made and final proof taken during the absence of the examiner. The amount of time on corrections was not noted. The proofs were taken by the instructor.

The same test was given to 12 Froebel school pupils on March 21st. A description of their performances follows:

Pupil No. 5.—9th grade, age 16, began printing December 1st. Other shop experiences: woodworking, clay, painting, and mechanical drawing.

Started 8:25. He set stick at 27 picas, knew that there were 6 picas to the inch, but didn't know how many points there were to the inch. He put the work in the galley at 10:05 without help. Justified and tied it up for proof and took the proof with plane at 10:15. He filled out a blank and decided to change length of dotted rule for names. Completed proof at 10:40. He asked the instructor if he could distribute the matter before leaving the shop. Total time, 2 hrs. 15 min.

Pupil No. 6.—9th grade, age 14, began printing in February, 1916. Other shop experiences: sheet metal, store, manual training and mechanical drawing. He has been in school four years.

Started 8:25. He set his stick at 27 picas. He wanted one half inch margins, he knew there were 72 points to the inch and 6 picas to the inch, looked the work over carefully before emptying the stick, asked for help in taking the material out of the stick and putting it in the galley. He tied it up and took a proof at 10:40. Completed the matter at 11:25. Total time, 3 hrs.

Pupil No. 7.—9th grade, age 15, began printing in December, 1915. Other shop experiences: plumbing, mechanical drawing, and manual training. (He held the swimming championship of 1,800 boys in Gary and also the Wig Wagging championship of the Boy Scouts.) The instructor said he had learned press feeding in two days.

Started 8:25. He set the stick at 27 picas because it equaled four and a half inches. When asked how many points is the M quad in this case, he gave the correct answer, ten points. "Can you set up one inch with ten point M quads?" Answer, "No." "How near can you come?" Answer, "Within two points." Material put in galley at 10:30. Tied it up and took proof at 10:50, completed at 11:25. Total time, 3 hrs.

Pupil No. 8.—9th grade, age 14, had been taking printing for two terms. Had no other shop experience. It was his first year in Gary.

Started 8:25. Set stick at 27 picas. He knew that six picas equaled an inch and that there were 72 points to the inch. He was asked the width of the copy from top to bottom in inches and reasoned that, as there were thirteen lines in the copy and the type was 10 point size, 130 points had to be divided by 72 points to obtain the number of inches of matter. He took his own work out of the stick and tied up his matter at 10:15. Took his own proof. He took one of his proofs, filled it out as a blank to test whether the length of line was suitable. He found no other correction necessary. He ruled border with pencil to show margins. Completed at 10:50. He asked the instructor if he could distribute the matter before leaving the shop. Total time, 2 hrs. 25 min.

Pupil No. 9.—9th grade, age 14, had had three terms of printing. Had also had woodworking and mechanical drawing.

Started 8:25. He set the stick at 27 picas. When asked why, said "It is four and one half inches." Asked if he could set up one inch with M quads, he answered "No." "How near to one inch could you set up with M quads?" Did not know the number of points to one inch. "How many 12 point M quads to one inch?" He first guessed five, but when checked, said 12 points to one M quad and six M quads to one inch. Put in galley at 10:05. He took the first proof at 11:20, made correction of one period on first proof and ran off corrected proof at 11:25. Total time, 3 hrs.

Pupil No. 10.—9th grade, age 15, had had two terms of printing. No other shop experience. He had lived in Gary six years but had not attended the public schools. Was backward in ability to reason.

Started 8:25. He set stick at 28 picas. When asked why, he said he measured the typewriter copy and found it to be 28 points. "Is typewriter type the same width as your 10 point?" Answer, "Seems like it." He assumed the card was 3 in. x 5 in. though the paper in front of him called for 3½ in. x 5½ in. He did not know how many picas there are in 5 inches and did not know picas or points. Tied up at 11:05, took proofs at

11:12, and completed the proofs at 11:30. Total time, 3 hrs. 5 min.

Pupil No. 11.—9th grade, age 12, began printing February 1st. Other shop experiences: sheet metal work, boiler room, storeroom, and clay.

Started 12:53. He set his stick at 29 picas but changed to 25 picas to get four picas on margin. "What part of an inch is four picas?" Answer, "Two thirds." Took proof at 2:45, started corrections at 3 o'clock. Took his second proof at 3:42 and completed the work at 4:10. Time, 3 hrs. 17 min.

Pupil No. 12.—10th grade, age 14, had printing four terms. Had a little mechanical drawing and woodwork.

Started 12:53. He set the stick at 33 picas which equaled 5½ in. He changed it to 27 picas to have three picas margin. "How many points to an M quad?" Answer, "Ten." "Could I set an inch with these 10 point M quads?" Answer, "72 points to an inch." "Can't I make 70 points?" Took his work out of the galley without help. Took his first proof at 2:50, started corrections at 3:02, and completed the matter at 4:00. Total time, 3 hrs. 7 min.

Pupil No. 13.—9th grade, age 14, began printing February 1st. Other shop experiences: clay, sheet metal work, boiler room, mechanical drawing, woodwork, and store work.

Started 12:53. He set his stick at 24 picas. He could not tell why. He changed it to 27 picas by figuring out with type gauge to get three picas margin. "What part of an inch is three picas?" Answer, "One half." Took first proof at 3:20, completed at 4:15. Total time, 3 hrs. 22 min.

Pupil No. 14.—10th grade, age 15, had printing four terms. Other shop experiences: manual training, mechanical drawing, architectural drawing.

Started 12:53. He set his stick at 29 picas so as to have two picas on the margin. Knew that there are six picas to the inch, 12 points to a pica, and 72 points to the inch. He emptied his stick without help. He looked over his work carefully before taking the first proof. Took proof at 3:10, made corrections, and took second proof at 3:28. Completed the work at 3:38. Time, 2 hrs. 45 min.

Pupil No. 15.—9th grade, age 13, had two terms of printing. Other shop experiences: mechanical drawing and manual training.

Started 1:12. He set his stick at 27 picas to get a half inch margin. He knew that there are six picas to the inch and 72 points to the inch. He put his work in the galley with help, looked over his work carefully before tying up, and took the first proof at 3:10. He took the second proof at 3:30 and completed the matter at 3:54. Total time, 2 hrs. 42 min.

Pupil No. 16.—9th grade, age 13, had printing two terms. Other shop experiences: mechanical drawing and manual training.

Started 1:18. He set his stick at 29 picas to give two picas margin. He took the first proof at 3:15 and completed the work at 3:35. Total time, 2 hrs. 17 min.

The boys in the print shop of the Froebel school thus showed unusual intelligence in handling the test. Their knowledge of the point system seemed to be sufficient to enable them to set up their work with judgment. There was only one boy who did not set his margins by picas. All the others in the Froebel group who were tested could tell how many picas margin they had left. Some of the younger boys in this shop were performing quite difficult jobs. A nine year old boy in the 4B grade was operating a Chandler and Price press. He had been working in the printing room since September, 1915. When asked how many points to the inch, he promptly replied 72. He stood on a box in order to reach the operating parts of the press. He worked in a businesslike manner. If a card did not rest properly on the gauge pins, he threw the lever very promptly and did not spoil any work while under observation.

E. Woodworking Test

TEST AND METHODS OF SCORING

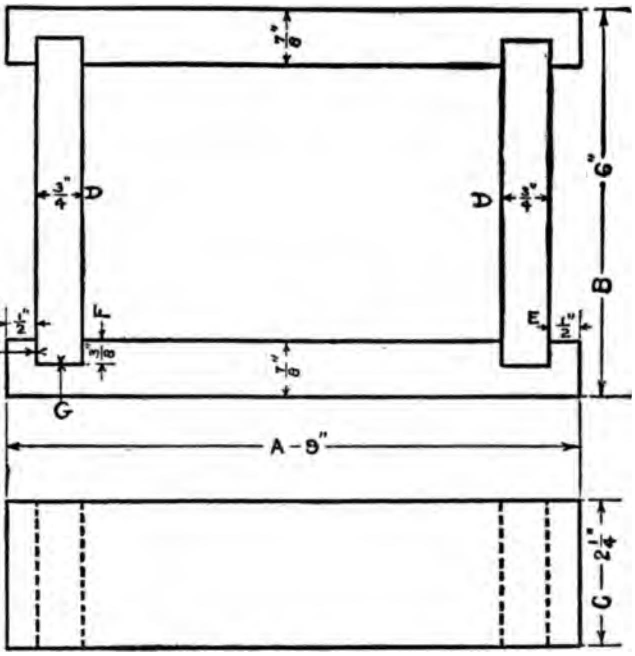
In the case of the woodworking test held on March 17th, 20th, and 21st, the results are set forth on the basis of the point system. Each deviation of $\frac{1}{32}$ in. from the significant dimensions is noted as one point and is deducted from 100 as a final rating.

G and H were measured on each of the eight faces of the joint and the sum of the openings in thirty seconds of inches was noted as the total penalty in each case.

Figure 5

Test Piece—Woodworking

ACCURACY OF FITS AND MEASUREMENTS WILL BE RATED



The degree that the joints were out of square considered from the standpoint of the top view was found by placing the try-square against one of the long sides of the frame and noting the deviation in thirty seconds of inches from the blade at the far end of the short piece.

A blueprint of the drawing shown in Figure 5, without the letters, together with a piece of whitewood 30 in. x 2½ in. x ⅞ in., machine dressed on the two faces and jointed on one edge, was given to each pupil.

The ratings on the point basis are given in Table XII.

INDIVIDUAL TRAINING AND PERFORMANCES

When the group started on the test, each boy spent about two minutes looking over the drawing and then began laying out his pieces. The boys did not seem to copy each other's procedure and showed understanding as to the reasons for the various steps. Seven boys started, but two were absent on the second day and did not complete the test.

The individual performances are noted below:

Pupil No. 1.—7th grade, age 13, had had woodwork for two terms. He had also had plumbing, printing, boiler room, and mechanical drawing for one term each.

Started 8:15. He studied the drawing and laid out the lines with pencil, did not use the marking gauge for the width of the stock but measured it by drawing parallel lines with blade of square, laid out the joints with pencil, attempted to remove ⅛ in. of wood from the width of piece by driving it off with a chisel, later used plane. He cut pieces to length, then planed short pieces to width, laid out joints, and then cut joints in order. He started to nail his pieces together at 10 o'clock. One

TABLE XII

Results of Woodworking Test

Pupil, Number		1	2	3	4	5
Age		13	13	12	13	15
Grade		7	7	7	7	7
Penalties — Significant Dimensions	A		1	2	3	3
	B	2	2	4	2	5
	C	1	1	1	1	1
	D	2	1	1	1	
	E	2	2	3	2	3
	F	2	2	1	1	2
	G	11	3	4	5	2
	H	One end broken off	13	2	7 One end broken off	9
Squareness		2	1	2	5	6
Total Penalties		22	26	20	27	31
Rating		78	74	80	73	69
Time	Hrs.	2	1	6	3	1
	Min.		45	20	30	50
Writer's Valuation		Fair Joints tight at sides	Fair	Good in execution but very slow	Fair	Fair Ends of joint well fitted

joint was too tight, and the end split off. Finished 10:15. Total time, 2 hrs.

Pupil No. 2.—7th grade, age 13, had had two months of woodwork; had also had mechanical drawing.

Started 8:15. He laid out the width of the piece by placing dots on each end and drawing between them with a rule. Sawed piece to length with hand rip saw. He knew what kind of a saw this was; worked rapidly. He started to cut his joints at 9:30, after preparing all of the pieces, sawed close inside of the line, removed the wood by using a chisel, cutting from the edge toward the center of each side. He completed the joints at 9:55. He nailed them up and stopped work at 10 o'clock. Time, 1 hr. 45 min.

Pupil No. 3.—7th grade, age 12, had had one term of plumbing and two terms of woodwork.

Started 8:15, March 17th. He used the gauge in marking the width of stock and tested carefully with square; was very slow. Finished 10:35. Worked for 2 hours March 20th, and 2 hours March 21st. Total time, 6 hrs. 20 min.

Pupil No. 4.—7th grade, age 13, was in his second term in woodwork, had had shoe repairing, clay work, and in drawing two weeks.

Started 8:15. He knew the use of the cross cut and rip saws, could distinguish them readily. He planed the edges by putting two pieces in a vise together, laid out the joints carefully, marked the depth and width with pencil, sawed right on the line. When questioned, he stated that he should have sawed inside the line and told why. Total time, 3 hrs. 30 min.

Pupil No. 5.—7th grade, age 15, had had one term of woodworking.

Started 2:15. He read the drawing and sawed the pieces to length with a cross cut saw. Drew lines on wood with pencil and rule; knew about the gauge but did not use it. In dressing the stock to a ¾ in. thickness for the end pieces he planed the double length piece to width and thickness before cutting to length. He laid out the joints and sawed right on the line making the joints too wide. One joint was tight, others were loose. After the pieces were all cut, he made several tests by assembling them before nailing them "to see if it was square." Finished 4:05. Total time, 1 hr. 50 min.

F. Sheet Metal Test

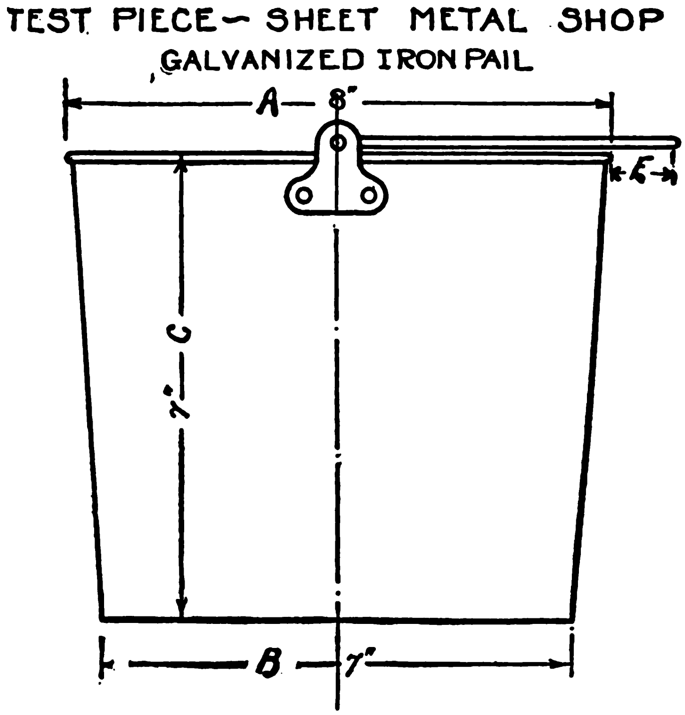
TEST AND METHOD OF SCORING

The sheet metal test was held May 2d, 3d, 4th, and 5th.

The test consisted in the making of a galvanized iron pail as shown in the drawing in Figure 6. The problem was presented with a statement as to the character of pail expected, together with the dimensions. A template of the side was furnished.

The instructor set the folder and wiring machines to the proper position. The boys worked independently and in orderly fashion and showed a pretty clear understanding of the operations needed for each step. Some

FIGURE 6



waiting was necessary on account of lack of sufficient number of scratch awls and cutting snips to go around.

Seven boys started on May 2d but only four completed the test. One boy did not return after the first day. Two worked for three days without finishing and did not appear on the fourth day.

In presenting the results of the work certain measurements have been noted on the point system and certain features of workmanship noted in brief memoranda. Rating D is an attempt to indicate the degree to which circularity of cross-section was achieved.

The results when thus rated are given in Table XIII on pages 196 and 197.

INDIVIDUAL TRAINING AND PERFORMANCES

The individual performances are noted below:

Pupil No. 1.—7B grade, age 14, in painting one term, sheet metal one term, and drawing one term.

Started May 2, 10:45. Folded joint, turned edge for wire on wrong side. Stopped 11:15. May 3, 10:15. Closed in wire with mallet and formed. Had long wire projecting from both ends. Said he would open and cut off wire later; rolled wire to the inside instead of outside, cut ends of wire and then ran through machine in reverse way to bring wire on outside. Closed side joint and burred lower edge on machine at 11:10. Stopped 11:15. May 4, 9:54. Asked for pattern for bottom. Traced around bottom of pail on flat sheet instead of using dividers to draw circle. Stopped 11:15. May 5, 10:15. Completed, 10:45. Total time, 3 hrs. 21 min.

Pupil No. 2.—8C grade, age 12, one term each in woodworking, drawing, and sheet metal.

Started May 2, 10:40. Pattern cut out at 10:50. Wired edge on wrong side. Cut and straightened wire at 10:55. Turned and closed in at 11:11. May 3, 10:15. Formed. Was forced to start end that did not

TABLE XIII

RESULTS OF SHEET METAL TEST

PUPIL, NUMBER	1	2	3	4	
Age	14	12	14	12	
Grade	7B	8C	8C	8C	
A—Inside diam. of top, $\frac{1}{16}''$ deviation = 1 point	5	6	2	2	
B—Inside diam. of bottom, $\frac{1}{16}''$ deviation = 1 point	4	2	2	2	
C—Height inside, $\frac{1}{16}''$ deviation = 1 point					
D—Vertical distance from top that disk $7\frac{1}{2}''$ diam. can enter. Standard $3\frac{1}{2}''$. $\frac{1}{8}''$ deviation = 1 point	11	1	1	2	
E—Distance from edge of pail to bail—Standard 1″. $\frac{1}{8}''$ deviation = 1 point	10	3	1	9	
Total Penalties	30	12	6	15	
Ratings	70	88	94	85	
Workmanship Locked and Grooved Vertical Seam	$\frac{1}{16}''$ out of line	$\frac{1}{8}''$ out of line. Tool marks	$\frac{3}{16}''$ out of line, even	Not well locked but even and straight	

Double Seam at Bottom	Uneven, badly drawn	Uneven, slightly drawn	Slightly uneven and drawn	Slightly uneven	
Wire Edge	Turned inside instead of out	Wire not well covered	Even but wire not well covered	Wire not covered in few spots	
Soldering	Rough and uneven	Smooth and even	Side smooth bottom rough	Smooth and even	
Riveting	Heads too large	Head formed on wrong side	Heads too large	Heads too large	
Bail	Ears ⅛" off center, uneven, end turns too sharp	Ears ⅛" off center, uneven	Ears ⅛" off center	Ears ⅛" off center	
Leaks	Bottom seam leaked	Bottom seam leaked slightly	None	None	
Time { Hrs. Min.	3 21	3 16	2 15	2 15	
Writer's Valuation	Rather poor in workmanship	Fair	Good	Good except bail	

have wire, gave him trouble owing to groove for wire being flattened. Closed in joint of side 10:39. Burred bottom edge on machine at 10:48, found bottom edge was not round. Stopped 11:15. May 4, 10:15. Only allowed $\frac{1}{8}$ in. additional diameter for size of bottom piece. Tried again. Cut bottom out and burred it. Cut bottom piece, burred, snapped on at 10:32. Stopped 11:15. May 5, 10:15. Completed at 11:00. Total time, 3 hrs. 16 min.

Pupil No. 3.—8C grade, age 14, in sheet metal two terms and mechanical drawing three terms.

Started May 2, 10:45. Folded joint at 10:50. Wired edge on wrong side. Cut wire, turned edge. Closed in wire. Formed side of pail, finished joint on side, closed end of wire. Stopped 11:15. May 3, 10:15. Burred lower edge of pail. Measured diameter of bottom, allowed quarter of inch for turning bottom. Set dividers at 3$\frac{5}{16}$ in. radius. When questioned about what size the bottom should be he put the pail down over circle scribed on metal and found it was too small. Finally got size of bottom by trial and error. Turned edge of bottom on machine and then with mallet on stake. Had trouble getting bottom piece to fit, made new bottom piece and said "Pail was not round, I got the wrong measurement." Stopped 11:15. May 4, 9:54. Soldered joints at 10:08. Punched for bail ears at 10:25. Finished 10:39. Total time, 2 hrs. 15 min.

Pupil No. 4.—8C grade, age 12, in sheet metal two terms and mechanical drawing two terms.

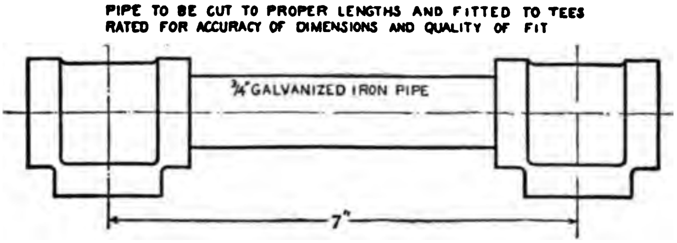
Started May 2, 10:45. Wired edge to wrong side, cut pattern, folded edges. Cut wire and straightened at 11:04. Stopped 11:15. May 3, 10:15. Turned edge, straightened wire well before closing in. Formed and closed side joint, trimmed bottom edge at joint, burred bottom edge of pail on machine. Complained that the bottom edge was not round, was told to bend on mandrel, measured bottom of pail and found it to be $7\frac{8}{16}$ in. Set divider $3\frac{27}{32}$ in. to obtain diameter of $7\frac{11}{16}$ in. Fitted bottom on at 11:00. Stopped 11:15. May 4, 9:45. Soldered inside of locked and grooved seam. Soldered bottom seam, put handle on and completed at 10:30. Total time, 2 hrs. 15 min.

G. Plumbing Test

TEST AND METHOD OF SCORING

The test in the plumbing shop was held on May 2, 1916. A drawing like that shown below was placed on the blackboard:

Figure 7
Test Piece—Plumbing Shop


PIPE TO BE CUT TO PROPER LENGTHS AND FITTED TO TEES
RATED FOR ACCURACY OF DIMENSIONS AND QUALITY OF FIT

After inspecting the drawing the boys selected a piece of pipe from the stock rack and cut it to length. After threading both ends they selected two tees and fitted these to the pipe.

The scheme of rating is indicated in Table XIV. In testing the alignment of the fittings a piece of pipe of a length to make the end come to 10 inches from the axis of the test piece was screwed into the face of each tee. The axes of the three pieces of pipe should, of course, be in one plane. A variation of ⅛ in. from this plane at the ends of the projecting pipes was penalized one point.

RESULTS

The first six boys made the common mistake of assuming that the dimension indicated between the centers of the tees meant the length of the pipe. In order to determine whether this was due to difficulty in reading the drawing or to carelessness, each of these boys, after completing the piece, was asked to examine the drawing and to tell what was indicated by the 7 in. dimension. With one exception they at once answered that the dimension showed the distance between the center of the tees. In the one case the boy made the same answer after a second look at the drawing.

An analysis of the results is given in Table XIV on page 201.

INDIVIDUAL TRAINING AND EXPERIENCES

Individual data are given below:

Pupil No. 1.—9th grade, age 15, since February

TABLE XIV

RESULTS OF PLUMBING TEST

PUPIL, NUMBER	1	2	3	4	5	6	7	8	9
Age	15	14	14	14	14	12	14	14	16
Grade	9	9	9	9	8	7	7	8	9
Length—1/16" deviation penalized 1 point	28	37	37	30	28	28		4	1
Variation of 1/16" in length of threaded ends in fittings from norm of 3/8", penalized 1 point	4	3	1	2		1		2	
For each end of pipe not reamed, 2 points deducted, not well reamed, 1 point	2		2	2					
Alignment of Fittings	3	5			1	3	5 .	2	
Total Penalties	37	45	40	34	29	32	5	8	1
Rating	63	55	60	66	71	68	95	92	99
Time (Min.)	15	23	27	32	34	27	57	43	46
Writer's Valuation	Fair Rapid worker	Fair	Good except for mistake in length				Good	Good	Very good

in plumbing shop and in mechanical drawing same time.

Started 10:20. Selected pipe with threaded ends, cut off both ends, reamed one end, both ends threaded 10:33. Finished 10:35. Total time, 15 min. Result: Measured $8\frac{3}{4}$ in. between centers, length of pipe 7 in. One end not reamed, both ends in tee $\frac{1}{4}$ in. One tee $\frac{3}{8}$ in. in 10 in. out of line with other.

Pupil No. 2.—9th grade, age 14, in school since February, plumbing since then, also mechanical drawing.

Started 10:20. Cut off both ends, used oil, finished 10:43. Total time, 23 min. Result: $9\frac{5}{16}$ in. between centers, pipe $7\frac{1}{2}$ in., both ends reamed well. One end in tee $\frac{1}{4}$ in., one $\frac{5}{16}$ in. Tees $\frac{5}{8}$ in. in 10 in. out of line.

Pupil No. 3.—9th grade, age 14, in plumbing since February, also mechanical drawing.

Started 10:20. Finished 10:47. Total time, 27 min. Result: $9\frac{5}{16}$ in. between centers, pipe $7\frac{3}{4}$ in., neither end well reamed. One thread in tee $\frac{7}{16}$ in., one $\frac{3}{8}$ in. Tees in line.

Pupil No. 4.—9th grade, age 14, third year in school, second term of plumbing, cabinet shop one term each for three years, mechanical drawing three terms this year and one term last year.

Started 10:30. Not able to tell names of fittings, very bad job cutting off ends, reamed, but very badly. Finished 11:02. Total time, 32 min. Afterwards said dimension goes to end of pipe, then said to middle of tees. Result: $8\frac{7}{8}$ between centers, pipe 7 in., both badly reamed. One end in tee ¼ in., one ⅜ in. Tees in line.

Pupil No. 5.—8th grade, age 14, in third term of plumbing in three years, had had mechanical drawing two terms and woodworking one.

Started 10:40. When cutting second thread squashed his pipe in large vise; started second pipe, finished 11:14. Total time, 34 min. Results: 8¾ in. between centers, pipe 7 in., fairly well reamed. Pipe in each fitting ⅜ in. Tees ⅛ in. out of alignment.

Pupil No. 6.—7A grade, age 12, had plumbing two terms this year, one term two years ago, printing one year, painting two terms, woodwork one term and mechanical drawing one term.

Started 1:26. Finished 1:53. Total time, 27 min. Result: 8¾ in. between centers, pipe 7 in., fairly well reamed. One end $\frac{5}{16}$ in., one ⅜ in. in fitting. Tees ⅜ in. out of line.

Pupil No. 7.—7B grade, age 14, had plumbing one term two years ago, cabinet work one term, clay work half a term, and painting one term.

Started 1:36. Finished 2:33. Total time, 57 min. Result: 7 in. between centers, fairly well reamed, both ends ⅜ in. in fittings. Tees ⅝ in. in 10 in. out of line.

Pupil No. 8.—8A grade, age 14, in plumbing one term two years ago, printing one term, mechanical drawing four terms, and woodworking one term.

Started 1:32. Threaded both ends of pipe. An older boy who stood by him apparently made a suggestion.

Afterwards he cut off one end and rethreaded. Finished 2:15. Total time, 43 min. Result: 6$\frac{3}{4}$ in. between centers, pretty well reamed, both ends $\frac{7}{16}$ in. in fittings. Tees $\frac{1}{4}$ in. out of line.

Pupil No. 9.—9th grade, age 16, two months in plumbing shop last term, tinsmithing two terms, woodworking one term, and mechanical drawing one term.

Started 1:47. Reamed. Finished 2:33. Total time, 46 min. Result: 6$\frac{15}{16}$ in. between centers, well reamed, both ends $\frac{3}{8}$ in. in fittings. Tees in line.

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